Author: Pennsylvania Live Stock Breeders' Association

Title: Proceedings and papers of... annual meeting, 1905

Place of Publication: Pittsburgh, Pa.

1905

BULLETIN NO. 11, OF

THE PENNSYLVANIA LIVE STOCK BREEDERS' ASSOCIATION.

PROCEEDINGS AND PAPERS OF THE

SIXTH ANNUAL MEETING.

HELD AT

HARRISBURG, JANUARY 25-26, 1905.

F. D. BARNHART, President.
E. M. BAIR, Vice President.
D. B. FISHER, Treasurer.

W. F. HOLTZER, Secretary,
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PROCEEDINGS AND PAPERS

OF

SIXTH ANNUAL MEETING

OF

The Pennsylvania Live Stock Breeders' . . . Association

HELD AT

Harrisburg, January 25-26, 1905.

OFFICERS:

President.....W. C. NORTON, Aldenville
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1905
THE AXTELL-RUSH PUBLISHING CO.
PITTSBURG, PA.

PENNSYLVANIA LIVE STOCK BREEDERS' ASSOCIATION

Proceedings of the Sixth Annual Meeting

held at

HARRISBURG, IN BOARD OF TRADE ROOMS

January 25 and 26, 1905

PREFACE

The Report of the Sixth Annual Meeting of the Pennsylvania Live Stock Breeders' Association is presented on the following pages. The lengthy discussion of the State Fair Bill on the evening of the 25th is omitted, since the bill which was prepared with so much care by our Association died in in Committee. Nevertheless we are farther along with this work than ever before, and full of hope for another trial of our strength. The thanks of the Association are due Hon. L. O. McLane, of Crawford county, who introduced and worked for the bill; and to President Norton and others who used their influence to further it. Another bill will be prepared and presented to the next legislature in the hope of more favorable action.

I desire especially to call attention to the excellence of the addresses at this short convention, which began the evening of the 25th and closed the 26th.

The Secretary of Agriculture, Hon. N. B. Critchfield, aided the Association in every possible way, and I desire to thank him for many favors received at his hands. He is using some of this report in his official report. The list of breeders has been revised with great care, two letters having been addressed to each delinquent before his name was stricken off. It is to be hoped that a larger list will appear in our next report.

E. S. BAYARD, Secretary.

Convention called to order by President Norton at 7.55 P. M.

President Norton: The first thing on the program is the address of the President. I think we will lay that aside for the present. I am sorry the weather* is such that a great many from the outlying districts cannot be here. We have a good program for to-morrow. We want you to stay with us and help us during the meeting.

*Note.—A terrible blizzard was raging which caused the Pennsylvania Railroad to stop all traffic and quarter through passengers at hotels in Harrisburg. Some of our members did not reach Harrisburg until the convention had adjourned.

We will now listen to the report of the treasurer.

Mr. Lantz:

Mr. President and Gentlemen of The Pennsylvania Live Stock Breeders' Association: Following is your treasurer's report of receipts and expenditures, since the last annual meeting held at Pittsburg, February 10th, 1904, to date:

Receipts.

Balance on hand at last annual meeting	$ 3.98	
Appropriation from Department of Agriculture	150.00	
Receipts from Advertisements in Annual Report	75.00	
Annual Dues	100.00	
Total income		$328.93

Expenditures.

Expense of lecturers at last annual meeting	$121.30	
Secretary's expenses	28.91	
Treasurer's expenses	17.20	
Stenographer's bill	40.00	
Publication of Annual Report	93.57	
Total expense		$300.98
Balance cash in the treasury		$ 27.95

Now, gentlemen I must come at you with the same old story that our receipts are not enough to pay our necessary expenses. I presume you are tired hearing me telling you this, but if you don't want to hear it any more you must elect another treasurer. It is true we got out the report, but who did it, and how was it done? No job printer would do the work for the amount of cash we had on hand to pay for it, and not wanting to run the association in debt, The National Stockman and Farmer, in order to help us out, agreed to take the $93.57, the amount we had on hand, and do the balance for nothing. Last year the same number of copies cost us $133.45 and that bid was lower than the lowest of any of the Pittsburg jobbers; this year the Report is larger and better, and would have cost $150.00 from any other publisher, and your Secretary had to ask The National Stockman and Farmer people to do it for $93.57 and they did it. I move that a vote of thanks be extended by this association to Mr. Bayard, and The National Stockman and Farmer of Pittsburg, for this service.

[Carried.]

Audited January 26, 1905, by committee and found correct as reported.

M. P. SHOEMAKER,
GEORGE ERK,
HENRY PALMER,
Auditors.

The President: We will now have the report of the secretary, Mr. Bayard, of Pittsburgh.

Mr. Bayard: My report is all printed here and has been distributed. I have little to add except to say that I have written hundreds of letters and sent out many circulars. This meeting has been advertised in some 300 papers in the State of Pennsylvania, and I think all of the breeders of the State have had a chance to know of it.

The President: We want your moral support; we also want your dollar and cent support. There are a great many in this audience who are not members of this association that I know are interested in breeding. We want your support. Join the association. Our treasurer, Mr. Lantz, is here, and he will be glad to receive your money at any time.

The first speaker of the evening is Mr. J. C. Duncan, of Lewiston, New York, "The Profitable Sheep."

THE PROFITABLE SHEEP

"The title of this subject embraces a wide latitude of questions. Every breeder interested in any of the improved mutton or fine wool breeds will advocate the breed he is directly interested in as being the most profitable sheep. And this must be conceded to a certain extent, as certainly no breeder of the present day would engage in and continue in breeding a sheep that was unprofitable to him as a business. So we will not take up the point of which is the most profitable breed, but for a moment discuss the profitable sheep. In my experience in feeding both cattle and sheep, I have always found I could produce mutton much cheaper than I could produce beef, for the amount of food consumed. Notwithstanding this fact, high class lamb and mutton usually sells at a higher market value than beef of the same grade. But allowing them to sells for the same price pound for pound, we have still a handsome balance in favor of the profitable sheep, from the revenue of from the fleece of wool, which usually amounts to from $2.00 to $3.00 per head, in the average mutton breeds kept on the farm principally for butchers' lambs, and considering the very limited amount of care they require, these are some of the facts we must credit to the profitable sheep.

Two Incomes.

It is an all-important fact in every branch of industry to consider the source of income, and as related above, sheep usually afford two annual incomes, namely, lambs and wool. But to keep in touch with our subject, the profitable sheep, we might first consider it in a pure bred standard flock, the progeny of which is usually sold to small breeders and farmers who make a business of producing butchers' sheep. We must start on sound fundamental principles, that of breeding an animal that will produce the largest amount of valuable meat for a given quantity of food, with the smallest amount of waste to the consumer. These should be the governing facts in the breeding of all animals for the production of high class meat, which must end up with the final test on the block, where the profit is calculated in dollars and cents. Now, to breed a profitable pure bred sheep, if our aim be to breed the highest class of sires of any of the approved breeds for use on the standard flocks of the country, we must have an ideal equal to what we expect to attain. And in forming this ideal: First, it is absolutely necessary to have a healthy, vigorous animal showing a strong constitution, as we must always bear in mind that the constitution of any animal in the foundation of all improvement. If we have an animal with all the fancy and fantastic points of our ideals with a poor constitution, what profit can we expect from the progeny of such animals? In the case of a sire it would prove utter ruin to a whole flock to tolerate any such animal in our flocks and herds.

Therefore, if we wish to make a name for ourselves as breeders of high class, profitable sires, we must see that we never lose sight of the utility parts of the kind of animals we are interested in. Hence I would urge all breeders of high class sires expecte to reproduce and improve our standard flocks to guard against being carried away by the fancy points instead of the utility parts, as the latter are essential in the line of improvement to make profitable sheep.

But to make a profitable sheep we must demore than get a sheep of superior breeding and constitutional vigor. In conjunction with the above it must be properly cared for from birth until it is either sold as a sire to head a pure bred flock, or to the butcher for consumption as meat. The care of that animal should be so that it is developed in as rapid a way as nature has provided in order that the development may be done with the least possible waste. This means the most generous and judicious feeding and care carried out in every part of the system. As any breeder of experience knows, with insufficient feeding and poor care a flock will very soon lose their vigor and degenerate. So that the more rapid growth means not only about one-third less cost in the production of our animals, but animals produced in this way are produced at a less cost for feed and are generally worth more pound for pound on the market. This is a decided encouragement for good feeding and early maturity to make a profitable sheep. The even, healthy, rapid development of the young animals is the great thing to be sought for in profitable sheep as in every other class of live stock feeding which is to fit animals for the consumer of meat foods of the present day It is the tender, juicy, high flavored mutton that tempts the appetite and fills our desires for that class of food, so that the matter of early maturity is of the utmost importance in the production of high class meat to make the profitable sheep. These are some of the things we must bear in mind in the production of high class animals for consumption as meat.

The question will now arise will it pay the average farmer and breeder of this class of stock? It has been my experience both in breeding high class pure bred sheep, also in growing sheep in a commercial way, that the best I could produce was always the most profitable sheep. The market is always good for meritorious animals either in breeding flocks or in case of lamb and mutton to supply hotels and restaurants in our large cities where the demand is far in excess of the supply.

There is no animal on the farm to-day that will give us more clear meat for the amount of food consumed and the work required to take care of it than the sheep. You can take the latest Buffalo market, fat lambs sold for $7.75 and as high as $8.00 per cwt. I do not see why each and every one of our farmers does not keep a few sheep to eat up the waste both in the summer and winter. Sheep are not expensive. If you have some roots for them, ensilage, corn or something like that they get along very well. I have seen sheep fed by the thousand on nothing but clear roots. Of course we could not feed sheep alone on that in this country. In my country we have a different climate, and we can feed sheep with much less expense than here. There certainly is a demand for that class of meat fitted up in the highest possible shape. Even for the prize stock that is produced for our large shows throughout the country there is a demand; in the largest cities the supply is not equal to the demand. There were a great many sheep that were shown at Chicago and over in Canada, and every one of those found their way either to Boston or New York, to be used by those large clubs there. If I were to tell you the price that some of those animals sold for you would hardly believe me. I know one man who sold to a club house in Boston and a hotel in New York fifty yearling wethers at an average price of twenty cents a pound dressed weight. If we can keep any animal on our farm to-day that will net us as much profit as this I would like to know what it is. I would like to have some of them.

Discussion.

What would be the live weight of those yearlings—about ten cents a pound?

Mr. Duncan: Yes, probably twelve. A yearling wether will dress about 60 to 62 pounds.

Q. Wouldn't do it on rye straw?

Mr. Duncan: No. You can keep a flock of breeding ewes through the winter on mangel wurzels, corn fodder and oats straw, any kind of hay. They are very easy to keep.

Mr. Lovejoy: We have a Dutchman out in Illinois who said he fed them on straw, but when pinned down said it was not very well thrashed.

Mr. Duncan: There are too many of our farmers who have few sheep. They say it don't pay well. They can't pay under the circumstances in the way they are kept. I know a farmer who lived near me who kept probably twenty or thirty sheep. He put them in the far end of the field and once or twice during the summer looked at them. We cannot expect to make money out of an animal in that way. In the winter take them up and let them run around the straw stack. For the pure bred flock we must keep them growing from the time they are born until the time we turn them off. You take a lot of lambs and feed them with clover hay and corn and they will develop in a way that will do very well for the market.

Q. How will ensilage do?

Mr. Duncan: It does very well, but it is not as good as roots. It does very well as a variety to help along. The more variety the sheep has the better it will do.

Q. Ensilage is less expensive than the roots, is it not?

Mr. Duncan: Yes, sir.

Mr. Lovejoy: In our part of the country we cannot get labor. The average western farmer will not get down on his knees and do the work necessary for roots.

Mr. Duncan: You do not have to get down on your knees. Take a hoe with a long handle.

Mr. Lovejoy: I raised a few sugar beets, but I got over that.

Mr. Duncan: It is a good thing to raise stock with. There is no question about that, especially in breeding animals. I never found anything that I could keep up the vigor and constitution and develop young stock as well as with roots.

Q. What breed of sheep do you consider most profitable?

Mr. Duncan: Well, of course that is a question I might be a little prejudiced about. You know I breed the Shropshires, but they are all good. If you have some other kind, some other variety, they will do just as well as the Shropshire if you take the same care; you will make just as much money out of them as I do out of the Shropshires.

Q. Just depends upon what you want them for?

Mr. Duncan: Yes.

Q. What per cent. of increase do you get?

Mr. Duncan: About 150 per cent.

Q. Do you mean you produce 150 per cent. or raise 150 per cent.?

Mr. Duncan: We drop more than that; we generally develop about 150 per cent.

Q. Lambing time is the time that requires the most care?

Mr. Duncan: I find one man can take care of about 25 ewes all right.

Q. What do the fleeces average on your Shropshires?

Mr. Duncan: I have sheared 17¾ pounds. The average will be probably ten pounds. We do not like to go below that for our Shropshires.

Q. What is the nature of the grass?

Mr. Duncan: When we seed down our pasture land we make a variety. We put in timothy, clover, alsike, fescue and orchard grass. We think we get a better sod when we seed down our meadows than with single plants, such as clover and timothy. They seem to last better; sheep do not seem to eat them so short.

Q. If you had a flock of breeding ewes about what weight would they average?

Mr. Duncan: 175 pounds in average breeding condition. That is, provided we have matured ewes, not young ewes.

Q. You mean breeding stock?

Mr. Duncan: Yes.

Q. Do you like a blocky type of Shropshires?

Mr. Duncan: Yes, I prefer one not too long.

Q. Isn't that the type which is more popular to-day?

A. Possibly.

Q. What will your wethers weigh?

Mr. Duncan: Will average about 175 pounds; some will weigh 250 pounds; 175 would be a fair average, very seldom go below that.

Q. At what age do you kill your wethers?

Mr. Duncan: Well, they generally drop in March. Something about a year. We never keep our herd over Christmas. It is not profitable to keep them after that; you can't get as much profit pound for pound.

Q. About 21 months?

Mr. Duncan: From eighteen to twenty-one months.

Q. Do you take your grade ewes and a pure bred sire?

Mr. Duncan: That makes a very good butcher lamb, very good wether.

Q. Isn't the Southdown considered the standard mutton sheep?

Mr. Duncan: It is to a certain extent, but I do not think it is the most profitable. A great many people think it takes it takes a whole lot of money to go into the sheep business to pay. You don't need a high class breeding ewe. Take a bunch of common grade ewes and a pure bred mutton sire and you make just as good lambs sometimes as from the pure bred for the butcher.

Q. Don't you consider that sheep are valuable for other purposes on the farm than just for the mutton—to clean up the weeds?

Mr. Duncan: I have a neighbor. One day I said to him, "John, why don't you get some sheep to eat up your weeds?" He said his fences are not good enough. I says, "Why, God bless you, man, you will never have any fences if you don't get the sheep. Get some sheep and the profit of that flock of sheep will pay for your fences." I know this to be a fact.

Q. Will the sheep clean the fence corners unless they are starved to it? I have had a flock of sheep for many years and they always prefer good grass. I want to know if it is necessary to starve them to make them clean up the corners? I want to know how to make my sheep clean up the corners?

Mr. Duncan: Send up to me and I will send down some sheep. (Applause.) There are some weeds sheep will not eat, but as a rule they will not let them go to seed. The only trouble I find is they do not want to eat the Canada thistles close enough. Outside of this I have no trouble unless it is on a run down farm. One year they kept them close, but for the last two or three years they have let them grow again. I do not know why that is.

Q. Can you keep sheep and cows in the pasture land?

Mr. Duncan: You do not need to. I was reading in some agricultural magazine there are 600 varieties of weeds and there are only four that the sheep will not eat. Of course, they will not live on them entirely, but they do keep the farm clean.

Q. How many sheep do you have in flock?

A. We have about 125 in the largest bunch.

Q. Do you keep your lambs in a separate division?

Mr. Duncan: We have a sliding door from the main sheep barn into the lambing pen. There are twenty pens arranged so the doors open on hinges. When the ewe lambs she is put into one of these pens and left for two or three days until she gets acquainted with the lambs and they are strong enough to turn them in with the bunch of ten or twelve. In the course of a few days we get ten or twelve together and they will generally run into the main barn again after that.

Q. Do you have trouble with ewes that won't own their lambs?

Mr. Duncan: Once in a while. We put them into the lambing pen I have just described for a few days until the lamb and the ewe get accustomed to each other.

Q. Do you ever have a ewe own one lamb and not the other?

Mr. Duncan: I take the lamb she will own away and get her accustomed to the other one.

Q. Is there not more profit in lambs when they are about three months old than when they are older than that?

Mr. Duncan: It depends upon what you want to use them for.

Q. Do you practice the English hurdling system?

Mr. Duncan: I do to a certain extent. We do that more with show sheep than with our common herd, our commercial flock. Of course it is hard to do in this country, the ground is so hard. It is a very good plan, especially where you are troubled with stomach worms, to keep your sheep on the clean ground. I do not think the stomach worms have been so bad these last two or three years as they used to be three or four years ago.

Q. In case a man gets strange sheep, buys them, wouldn't it be advisable for him to treat all the sheep for the stomach worm?

Mr. Duncan: It would be a good precaution to take with all sheep, no matter whether stomach worm or not, for all sorts of parasites, lice, ticks, and such as that. I believe it would be well to go over them with the gasoline treatment.

Q. How much gasoline do you use?

Mr. Duncan: Two dessert spoonfuls in a quarter of a pint of milk.

Q. You have spoken entirely of mutton sheep. Is there a place in the East for fine wool sheep?

Mr. Duncan: I have not had much experience with the wool sheep. There seems to be a certain demand for that kind of wool.

Note.—For details as to gasoline treatment see preceding annual report.

PREVENTION OF TUBERCULOSIS BY VACCINATION

ADDRESS OF DR. LEONARD PEARSON

For some years the State Live Stock Sanitary Board has been making experiments for the purpose of developing a method for preventing tuberculosis of cattle by vaccination.

This work was commenced nearly five years ago. It was attempted at first on a very small scale, and afterwards when it became evident, about two years ago, that it was possible to increase the resistance of an animal to tuberculosis to a very large degree by a process of vaccination, the experiments were then taken up on a large scale for the purpose of ascertaining whether it might be possible to develop a practical system for vaccinating cattle against this prevalent disease.

The process consists of injecting into the animal the living germs of tuberculosis of a variety that is found to be non-virulent for cattle. There are a great many varieties of the tubercle bacilli, varying in several respects, but chiefly in the degree of their virulence for different species of animals. There are some varieties that are absolutely non-virulent for cattle; that is, they do not have the property of producing disease in cattle in any degree. The special strain of germs that we are using for the vaccination of cattle is one that has been very thoroughly tested; enormous quantities have been injected into cattle with the view of ascertaining whether under any circumstances it might possibly be harmful. It has been found it is impossible by any process that has been used to infect an animal with tuberculosis by the use of this special culture. Of course, there are cultures that are deadly for cattle. The need for precise information on this point is of the very highest importance.

The process of inoculation consists of injecting a suspension of the tubercle bacilli, the tubercle bacilli being mixed up in a solution of common salt. We inject this solution into the circulation; that is, the injection is made into the jugular vein. And at varying intervals the injection is repeated. One of the purposes of our experiment is to ascertain just wnat dosage is necessary and just what intervals between doses should be employed and just how many doses gives the best results. So you can see that it is necessary to try different experiments on a considerable number of animals for the purpose of gaining information on these points. Another point that it has been necessary to gain information upon is with relation to the duration of the immunity that is produced by this system. Our first experiments showed that by repeating the vaccination several times it was then possible to inoculate the animal with a virulent culture that caused death in a short time in unvaccinated animals, and that the vaccinated animal will resist the inoculation with the virulent culture. When such vaccinated animals were killed some weeks after the inoculation with the virulent germs, it was not possible to find any trace of infection; while in the unvaccinated animals that were inoculated at the same time with the quantity of the same culture, very distinct lesions of tuberculosis were found. Indeed, some of our unprotected animals died within a short time as a result of this inoculation.

The Cattle in the Experiment.

We have under experiment now about one hundred cattle. These are kept on a farm that has been provided for this purpose by the State Live Stock Sanitary Board in Delaware County. The cattle that are on that farm are of three sorts. There are the vaccinated cattle, the cattle that have been vaccinated in different ways, with different cultures, with different dosage, with different intervals between vaccinations and with different numbers of vaccinations. That is one class of animals. Then there are the unvaccinated cattle which are kept there for the purpose of comparison. Then there is a considerable number of tubercular cows, cows in an advanced stage of tuberculosis. Now, vaccinated cattle and unvaccinated cattle are in constant daily contact with the tubercular cows, the idea being to continue this exposure for a considerable time, for several years indeed, and from time to time to kill the vaccinated and the unvaccinated cattle with the view to ascertain whether the unvaccinated cattle are infected and the vaccinated cattle are protected, and what system of vaccination gives most satisfactory results, so that we may know the system that we may depend upon in actual practice.

We have already proved that by a sufficient number of vaccinations a thoroughly practicable degree of immunity can be afforded, but, of course, the value of the process will depend largely upon the economy with which it can be applied, and so without going below the safety point, we want to know just how few vaccinations will give the result that is desired.

Favorable Results.

Recently, during the last month, we have killed a number of these experimental cattle. In the last lot destroyed there was six that had been vaccinated and three that were not vaccinated. Of these six that were vaccinated two were vaccinated twice, one was vaccinated four times, one five times, another five times, another six times, and then in another lot, that is, of another series, killed about the same time, one was vaccinated two times. The dose upon the first vaccination was small, the second was larger. Another was vaccinated ten times, the ten vaccinations being made for the purpose of ascertaining whether by repeated vaccination and whether by the use of very large doses any injury would come to the animal. Well, all of these vaccinated animals of this one series and two of the other had been in contact with tubercular cattle for more than a year, and some of them almost two years, and all of them were found to be in condition of absolute health. There was no sign whatever of tuberculosis in any one of these animals. The three controls of one series and the single control of the other series, making four in all, that had been exposed to contact with the tubercular cattle for some length of time were all tubercular, three of them to a very great degree, one of them rather slightly. In the last control there was a good deal of natural resistance and, although it became infected, the disease was not widespread.

Other systems of vaccination with other cultures have not been so successful. I have not the figures here with regard to them, but I don't think they are of special importance because some of the cultures we were using for the other series of vaccinations have now been discarded for this purpose because we found those cultures did not give satisfactory results. So that the general result of the vaccination with certain tested cultures has been satisfactory. The result with other cultures has not been satisfactory. So that it is perfectly evident that a great deal depends on the culture that is used; a great deal depends upon a thoroughness of the treatment with which the vaccinations are made. We are now beginning, on a small scale, to put this system of protection into practical use. We are trying, in our own experimental herds, for instance, the vaccination of calves as they are born; the calves from tubercular cows, the calves from the vaccinated cows, and from unvaccinated cows, are some of them vaccinated by different processes, and others are left without vaccination, with a view of determining whether calves if vaccinated and exposed constantly to disease may be grown in health. We have some cattle now in such an experiment that were born nearly a year ago. We have some a little more than a year old that, so far, appear to have resisted infection, but whether they will wholly resist infection or not can only be determined by the slaughter and the careful post mortem examination of these animals. So that I say that now any attempt to make a report on those cattle would be entirely premature because one cannot safely draw conclusions from their apparent condition during life. We must wait until a post mortem examination has been made.

The use of vaccination in other herds, as I say, has been started. We have begun to vaccinate young cattle in herds, in different places, and some of this work was started some months ago, and, so far, appears to have given very good results. That is to say the cattle have not been injured in the slightest degree by the vaccination. They have grown as well as unvaccinated cattle, they have had no backset. No unthriftiness has been caused by the vaccination. But whether these cattle will be protected as they grow up, it depends upon future investigation to determine.

Control of Vaccines.

In regard to the general use of vaccines, I think that Mr. Lovejoy brought out an exceedingly important point in his talk to-day. He told you of the prevention of hog cholera by an advertised system of vaccination, which really infected by inoculation and apparently produced the disease in the hogs that it was intended to protect. Vaccination with living organisms is always a very delicate process. We cannot be too particular or take too careful supervision. Evidently the vaccination that was applied to his hogs was made with a living culture of hog cholera bacilli and these bacilli were virulent for hogs and instead of protecting them they produced the disease. In discussing the matter with him last evening, and from the information that he gave me then, as well as what he said here this morning, from the order of occurrence of disease following the vaccination, it seems there could be no doubt that his hogs were infected by this process that was intended to protect them.

Well, cattle can be infected by tuberculosis by vaccination if the vaccine is not of absolutely perfect quality. And there is danger that vaccines may be put upon the market which are not reliable, which either are too weak and do not protect, or that are too strong, and produce disease. There is already a firm of druggists in New York City that is advertising very widely a vaccine against tuberculosis. It is brought from Germany. They make claims for it for which there is absolutely no foundation. They claim that this vaccine will protect cattle for their entire lives. Nobody knows whether it will protect cattle for their entire lives or not. The work is altogether too new to justify anybody in drawing such a conclusion. During the past summer I had an opportunity to visit all of the foreign investigators who were working along this line. I went abroad for the especial purpose of investigating the subject of vaccination against tuberculosis. I went to nine different countries and visited twenty or more investigators, and saw many animals that had been vaccinated, and I went everywhere that I could hear of any work of this character being done. So I know pretty well upon what the claims as to this German vaccine are based.

The German work has not been carried on as long nor upon such a large scale nor in such a systematic way as the work that has been done in this country. As I have said before, some of the claims for the vaccine that is now advertised are without foundation; and any one who uses it should should use it purely as an experiment; not with the thought that he is sure to gain protection, which those who put it out claim it will give.

I do believe and I am convinced that vaccination against tuberculosis is going to be a practicable process. It may be that the processes that we are now using will be sufficient. Whether they will be or not time alone will determine. But at any rate it can do no harm, and we are disposed to use it on a continually larger scale until we know all about it, or at least enough about it to justify us in recommending it for general application. If it continues to give as favorable results as it so far has given, there can be no doubt that within a year or two it will be used very widely and with great profit.

GROWING OUR OWN PROTEIN

By Prof. E. B. Voorhees, New Jersey Exp. Sta.

Proceedings of Thursday, January 26, 1905

The meeting was called to order by the president at 9.30.

President Norton: The first paper on the program this morning is by Prof. E. B. Voorhees, entitled "Growing Our Own Protein."

GROWING PROTEIN.

It is quite natural that for the raising of live-stock, the question of rations should be one of the most important, for next to breeding it is the question upon which success hinges, and we need no better evidence of the necessity of specific knowledge on the part of feeders than is given in the work of the various experiment stations. The investigations that have been conducted show not only the necessity for a broad intelligence in the matter of the preparation of rations, but also that this intelligence must be accompanied by definite information concerning what constitutes a food, and of the functions of the nutrients in the various groups of specific substances.

Twenty years ago animal foods, aside from hay and corn stalks, consisted mainly of cereal grains, or mixtures of them, whose feeding values were well established, together with the mill feeds derived in the manufacture of flour from wheat, rye and buckwheat. The other concentrated feeds on the market at that time, which were used in any considerable quantity, were linseed meal, cottonseed meal, malt sprouts and hominy meal. To-day an examination of the results of feed inspections in the various States, shows that in addition to those used twenty years ago there are now nearly one hundred different kinds, varying widely in their physical character, and in their content and cost of nutritive substances. As a preliminary, therefore, to the discussion of the main topic, I think it well to point out in some detail the situation in reference to food supplies that exists at the present day.

The principles of nutrition are the same today as they were twenty years ago though in the meantime much has been learned concerning the composition of the different groups of nutrients, the preparation of rations, and the specific functions of the nutrients. Neither has the primary object or purpose of feeding changed in this period, though much has been learned concerning the relation of feeds to the production of specific animal products, with the conditions the same in essential particulars; therefore, the question arises, is there any good reason why the whole grains and regular forage crops of the farm should not serve to-day as well as twenty years ago, as the chief source of the nutrients in the rations for farm stock? There is no reason from the standpoint of nutrition, why the whole grains, together with the refuse pro-

ducts, which were available then, should not supply the demands at the present time, and in many respects foods derived directly from home products are superior to rations that may be made up by farmers or dealers from the numerous by-products now on the market.

Whole Grains Differ from Feed Residues.

Nature has provided one thing in the constitution of the whole grains, which is not possessed by any mixture of other materials consisting of parts of whole grains, namely, uniform and fixed proportions of the pure nutrients, fat, protein and carbohydrates, and which when used with the ordinary roughage makes it difficult to cause injury from even careless methods of feeding. The chief advantage to be derived from the larger number of the different kinds of concentrated feeds at the present time, is that it is possible by means of them to reduce the cost of the ration and to adjust the nutrients more nearly according to what is believed to be the specific needs in the various purposes of feeding. It is more than likely that the use of feed rations, made up of one-third, by weight, of ground corn, ground oats and wheat bran, cannot be improved upon, from the standpoint of total product and effect upon the animal, by the use of rations made from the different kinds of feeds now on the market, and that the increase in the number of products is not due to necessity, but to changes in the manufacturing of the cereals and other farm products, as well as to the increased knowledge concerning the nutritive value of materials not formerly used for animal consumption.

The largest increase in the number and kind of feeds has come from the residues derived in the use of corn in the manufacture of starch and sugar, and the next in order by the increase in the number of residues derived from the manufacture of malt and distilled liquors, and to better methods of handling these refuse products. There has also been a great increase in the number due to the increased production of cottonseed and of flaxseed, and finally to more complete utilization of the refuse products as a result of the manufacture of oat meal from oats.

The character and composition, and frequently the palatability, of these feeds are in a general way determined by the object of the manufacturer of the original grain, whether to take from it one of the important and highly digestible groups of nutrients, and leave the others, or whether he takes the whole of the highly digestible, and leaves the bulky and indigestible, the hull or husk.

In the case of corn, the primary purpose is to remove from it as near as may be, all of the starch that is contained in it, or but one of the nutritive substances. Hence the total refuse product is richer in protein and fat, and poorer in carbohydrates, than the original corn, and thus from the standpoint of the feeder, a pound, or a ton, of the entire refuse would be for feeding purposes, worth more than the original corn, and inasmuch as the fat is corn-fat and the protein is corn-protein, there is no known reason why these actual food compounds should not be and every reason why they should be, quite as nutritious as in the original product.

As already pointed out, however, nature has provided in the whole grain good proportions of the pure nutrients, usually associated with the crude fiber in such a way as to make it a difficult matter to cause injury even from careless methods of feeding, while the manufacturer on the other hand, removes more or less of one of these nutrients, which, therefore, disturbs the proportions of the constituents, and the resultant feed, decidedly unbalanced, must be used more carefully, and with other products, if equally good results are to be obtained.

Refuse Feeds of Low Value.

There is, however, a class of feeds which have been placed upon the market in recent years, now large in number, and belonging to that class which are not concentrated in the sense that one or more of the highly digestible nutrients are contained in them, and which can not, therefore, be said to have added to the source of supply of desirable products, first, because they do not contain a class of nutrients that the farmer needs to purchase; and second, because the substances themselves are not highly useful. These are derived mainly from the residues in the manufacture of oat meals, and consist not of the richer portions of the grain as protein and fat, but of the poorer portions, the outside hulls, and consisting more largely of crude fiber than the original grain. That is, they contain very low percentages of protein and fat, and very high percentages of crude fiber. In fact, the oat hulls in themselves as a source of nutrients, are no better, and not as good as straw and stalks, the natural waste products of the farm. In this case, the object in making a feed is to utilize a waste of no considerable value in itself, while in the instances already noted, the object is to utilize residues of actual nutrients, and which are of considerable value. Because of the low feeding value of these by-products, because in themselves practically worthless from the nutritive standpoint, the method adopted has been to add a small quantity of other valuable feeds to these, and by attaching high-sounding names to the mixtures, and lower prices than are fixed for high-grade products, to encourage their wide use. There may be, and undoubtedly are, conditions where the use of these mixed products would be desirable, as, for example, where farmers do not have a considerable quantity of bulky material, and where the necessity is for bulk, as well as for actual nutrition. On most dairy farms, and also upon grain farms, there is usually an abundance of material of this sort, and for these farmers the purchase of oat feeds cannot be regarded as economical in any particular. In many cases, more or less of the concentrated feeds, as cottonseed meal, linseed meal, gluten meal, etc., have been added to the oat hulls, in order to increase the protein content, and consequent nutritive value, and that some returns may be obtained in their use.

These various feeds naturally fall into two general groups, one in which the protein is the chief constituent, and the other in which

the carbohydrates are largely in excess, or into protein and carbohydrate feeds. In the case of the protein feeds, there is a wide range in the amount of this substance which may be obtained for a given sum from the different groups, making it a matter of the very greatest importance for the farmer to ascertain the character of the feed that he desires, and that he should carefully study the relation between the content of nutrients and the selling price.

The carbohydrate group includes many of the oat feeds, and feeds prepared from refuse waste products, and while there is not so great a variation in the content of carbohydrates or in the content of protein as in the other class, they as a rule supply the farmer with this substance, which he already has in excess, and their purchase cannot be regarded as economical.

Investigations as to the functions of the various groups of nutrients, protein, fat and carbohydrates, have clearly established certain general principles, among which is, that of all of the groups of substances protein is the most important, because it is the only one from which the protein substances of the body may be derived, and because it may also contribute to the building up of the body in fat. It must, therefore, exist in all rations, whether fed for maintenance only, or for increase of animal product, and the amount of protein in reference to other substances exerts an important influence upon the production of animal product, whether of meat, milk or fat. Investigations, however, have not yet clearly indicated the exact relation that protein must sustain to the other substances in the rations, though that it shall be in greater excess in those rations intended for the building up of animal product than for those for simple maintenance, has been clearly indicated.

Studies of the composition of the ordinary home-grown products, for example, the cereal grains, have also made clear the fact that they are as a rule deficient in protein. Hence, in the preparation of rations for dairy cows, for young stock, and for the making of beef or mutton, the purchase of feeds resolves itself into a purchase of protein, provided economy in the use of nutrients is desired. It must not be understood, however, that economy in the use of nutrients is identical with economy in feeding, as it may very frequently happen that economy in the use of nutrients may not be economical feeding; conditions may be such that the feeder can better afford to waste a portion of his carbohydrates, than to purchase protein foods that will enable an economical use of them. The conditions of the feed markets at the present time show, however, that the average cost per ton of the protein feeds, or those which exceed in content of protein, any of those likely to be produced upon the farm, is but little greater than the average cost per ton of the feeds of the carbohydrate group. That is, the average cost of 31 different protein feeds, ranging from 15 to 44.5 per cent. protein, according to the records obtained at our Station last year, was $24.28 per ton. The average cost of 18 carbohydrate feeds, ranging from 8 to 13.5 per cent. of protein, and including all of the oat feeds, was $23.62 per ton.

In view of these facts, it is not likely to be an economical practice to waste carbohydrates, as the excess of the expensive carbohydrates could be profitably exchanged for the protein that is likely to be needed. The situation in relation to the supply of protein, and the cost, makes it a very pertinent question as to whether the farmer may not avoid in a measure the pitfalls likely to be encountered in the purchase of concentrated feeds by a larger growth and use of those crops which contain this important element protein in larger amounts than is contained in the average products now grown. The one objection that is offered to this line of procedure, is that in the making of rations it is necessary, in order that the animals may be properly nourished, that there shall be associated with the ordinary roughage products, more or less of the concentrated forms of nutriment, and that it is not possible to completely and satisfactorily nourish an animal under present artificial conditions.

There may be, and doubtless is, a basis of truth in this view. Nevertheless, it does not follow that though a farmer shall increase his acreage of protein crops, that he shall not feed more or less of the concentrates, and it does follow, I think, from the data we have at hand, that by increasing his protein crops, he decreases the necessity for purchase in just that proportion.

Experiments recently carried out in this country, and to which I shall refer more in detail later, clearly show that a number of crops may be grown which may for all practical purposes be substituted for the concentrated feeds, at a very great saving in the cost of nutrients, and a consequent reduction in the cost of a pound of beef, mutton or milk.

The Protein Crops.

The first question which naturally arises, is what kind of crops shall be grown, or what kind can be grown, that will enable the farmer to accomplish this most important result. Fortunately, recent studies have shown the adaptability to our conditions of a considerable number of crops and until recently, not largely grown, which may be used for this purpose. Crops, moreover, that are richer in the element protein, so important in any ration, and so necessary for the proper utilization of our other crops. These crops belong to the clover or legume family, and possess a further advantage, in that their growth and removal from the soil does not materially reduce the content of soil nitrogen, but rather adds to the crop-producing capacity of soil by improving physical character, and increasing their store of nitrogen.

Further, because of the number of plants belonging to this group, and because of their wide range of adaptation to the various conditions, it is possible to introduce one or more of them into the regular systems of farm practice, without interfering with useful and profitable rotations. Many of them, for example, the various clovers, red, crimson and alsike, are already grown extensively, and their value in the rotation well understood by practical men. There are many others, however, whose characteristics

of growth and adaptability to the various conditions have not been carefully studied until recent years, and whose usefulness, therefore, is just beginning to be appreciated. Among these are the Canada field pea, the soy bean, the cow pea and the various varieties of vetch, all possessing that valuable power of appropriating for their use the free nitrogen of the air, and thus contributing directly to the potential fertility of the soil.

Another crop belonging to this class, which is yet in its experimental stage in the Eastern States, is even more valuable than any yet mentioned, namely, alfalfa. For feeding purposes there is no plant that is so promising, first, because of its high feeding value; second, because of its rapid growth, and consequent large annual yield; and third, because it is a perennial, and may be harvested from year to year without expense of reseeding or of cultivation. The experiments thus far conducted seem to point to the fact that this crop can be grown wherever good corn can be grown. That is, on soils naturally well drained and reasonably fertile.

The experiments conducted at the New Jersey Station, show that the average cost per ton of dry hay, for five years, even with heavy manuring, was but $5.26 per ton, and that the feed value of this hay compares favorably with the protein feeds, which at present prices cost $22 or more per ton. This crop, more than any other, fulfills that very important requirement, a cheap source of protein for balancing other home-grown products. Its growth cannot be too strongly recommended. An ideal situation would be where the farm is growing corn and alfalfa to supply the entire needs of the herd.

The introduction of nitrogen-gathering crops has, too, a greater significance for the man who manufactures any form of animal product than for the grain farmer, because the selling or market price of the grain or hay crop is not enhanced because of its containing a larger amount of nitrogen, while it does increase feeding value, as the nitrogen is the basis of the protein of his ration, the substance which is usually deficient when only the regular farm crops are used, and if without home supplies must be purchased.

Other protein crops, not now largely grown, and which possess these desirable characteristics, are crimson clover, cow peas, soy beans, winter and spring vetch, and field peas. Crimson clover is in the true sense a catch crop, and thus when it can be successfully grown is a positive addition to the regular crops of the farm in addition to its value as a source of protein. The hay is richer in protein than red and alsike clovers, is palatable, and will successfully substitute an equivalent quantity of protein in other hays of the same class. The chief disadvantage from the standpoint of the hay grower, is that it matures too early to permit of its full use as a hay crop. It certainly can be successfully grown when conditions are right in all of Eastern Pennsylvania, and its introduction will add not only to the home supplies of protein, but will assist in soil improvement.

The cow pea and soy bean are summer forage crops, and in addition to their soil improving characteristics, are excellent sources of protein, used either as green forage or hay. These plants may be successfully grown in many portions of this State and without interfering with regular rotations, as the crop may successfully follow a crop of oats and peas, cut for hay, and make a crop of hay in time to seed down with wheat or rye.

The Canada field pea and the spring vetch are preferably used with oats, and while the mixture is not as rich in protein as if seeded alone, or not as rich as the other crops mentioned, they are valuable additions to our list of forage crops.

Winter Vetch is also serviceable, more particularly as a green forage crop than as hay, and should be sown with winter wheat or rye.

The average content of protein in these various leguminous hay crops, is for:—

	Per Cent. Protein.
Red clover	15.3
Alsike clover	11.4
White clover	14.1
Crimson clover	15.5
Alfalfa	
Cow peas	15.5
Soy beans	15.4
Canada field peas	13.7
Vetch	17.0

These averages compare very favorably with those shown by the bran and middlings from wheat, rye and buckwheat:—

	Per Cent. Protein.
Wheat bran	16.1
Wheat middlings	15.6
Rye bran	14.7
Buckwheat bran	12.4

Owing to the larger content of crude fiber in the protein forage crops than in these various concentrated feeds, showing the same content of protein, they are more bulky, and the rate of digestion of the various groups of nutrients is usually lower than in the feeds, thus making this basis of comparison hardly fair to the feeds, though the average digestibility of the two classes of foods is not widely different. The average co-efficients of digestibility are:—

For Wheat Bran:—	Per Cent.
Dry matter	61
Protein	79
Crude fiber	22
Nitrogen-free extract	68
Ether extract	68

For Alfalfa:—	Per Cent.
Dry matter	60
Protein	74
Crude fiber	43
Nitrogen-free extract	66
Ether extract	39

For Crimson Clover Hay:—	Per Cent.
Dry matter	62
Protein	69
Crude fiber	45
Nitrogen-free extract	62
Ether extract	44

For Cow Peas:—	Per Cent.
Dry matter	59
Protein	65
Crude fiber	43
Nitrogen-free extract	71
Ether extract	50

For Soy Beans:—	Per Cent.
Dry matter	62
Protein	71
Crude fiber	61
Nitrogen-free extract	69
Ether extract	29

It is evident from the data now available that protein forage crops are important sources of protein. The questions of practical interest to the feeder, therefore, are: First, can they be successfully grown? Second, is the yield of nutrients per acre large enough to make their growth desirable? Third, the economy of their use as substitutes for the concentrated feeds.

In reference to the first point, it may be said that of all the crops mentioned can be successessfully grown in all parts of New Jersey, and certainly in many sections of Pennsylvania, though inasmuch as a number of them are relatively new crops, some knowledge must be possessed concerning the proper time and method of seeding, and of handling the crop.

Alfalfa A Success.

In the case of alfalfa, it has been pretty clearly proven, that the plant is hardy in all of the Middle States. It is, I think, a fact that there are more failures than successes. The failures are, however, due in many cases to improper methods of seeding, to lack of proper fertilization, preparation of soil, and to the absence of the specific alfalfa bacteria in the soil. In New Jersey, where success has been attained, the following points have been carefully observed:

First, a soil naturally well drained, with a subsoil not too compact; second, the land limed at the rate of 30 to 40 bushels per acre, and thoroughly mixed with the soil; third, an abundance of available mineral food, derived from acid phosphate, ground bone and muriate of potash; fourth, thorough preparation of the seed-bed, making it as fine as possible; fifth, an abundance of good seed, at least 30 pounds per acre, and should be seeded either early in spring, as soon as danger of frost is past, or early in August, and without cover crop; sixth, inoculation of the soil with portions of soil from old alfalfa patches, or with the pure cultures; seventh, spring seedings should have the weeds kept down by frequent cutting; eighth, the crop cut when blossoms begin to appear, and this without regard to the size of the crop; ninth, the curing of the hay carefully performed. Handle before too dry, and allow to cure in cocks.

It may be that a successful catch and subsequent profitable crops do not require attention to all of these points, though all have been observed in those entirely satisfactory.

Cow peas and soy beans should not be seeded until the latter part of May. A safe period to begin seeding, is the last week in May. The best soils are those of a sandy or porous nature, or those that may be described as open and friable. Land should be preferably limed (though it is not so essential as in the case of alfalfa), and well supplied with phosphoric acid and potash. Seed at the rate of 1½ bushels per acre, if broadcasted, and from three pecks to one bushel per acre, if put in in drills. The crop should be harvested when the pods are just beginning to form, and in curing should be handled in the same manner as described for alfalfa.

Crimson Clover.

Crimson clover seeded in corn at the rate of 12 to 15 pounds of seed per acre, at the last cultivation, and lightly covered by a harrow or light cultivator. This crop grows ordinarily where corn grows well, and failures to withstand the winter are due more often to a lack of lime and other plant-food, and the specific bacteria in the soil, rather than to any lack of hardiness. When seeded primarily for a forage crop, or hay, the land should be well prepared, and about 15 pounds of seed broadcasted and lightly covered. The hay crop will be ready to harvest by the 20th of May. The combined crops of oats and peas, and oats and vetch, are readily grown wherever oats do well.

The New Jersey Station's experiments show a considerable variation in the yields of different years, due to seasonal and other conditions, though the average yield of alfalfa has been five tons; of cow peas, soy beans and crimson clover, about 1½ tons per acre each, though as high as an equivalent of four tons of crimson clover hay has been secured. The peas, beans and clovers have shown a wider variation in yield than in the case of the alfalfa, which is doubtless due to the fact that the yields of different years have been obtained from the same acre.

The average cost per acre is, for alfalfa, $26.30; for cow peas and soy beans, $10, and for crimson clover hay, $4.50, the latter when seeded in corn, as the main cost is the seed and harvesting; it would be greater when the land is specially prepared for the crop, though naturally the yield would also be greater, probably making the cost per unit of crop not widely different. The differences in the cost of cow peas are largely due to variations in the cost of seed, as the cost of preparation of land and fertilizer has been practically the same each year. Based upon average yields, therefore, the cost per ton of alfalfa hay is $5.26, the cost per ton of cow pea and soy bean hay, $6.66, and of crimson clover hay, $3 per ton. The average yield per acre of nutrients has been for:—

	Protein. Lbs.	Fat. Lbs.	Fiber. Lbs.	Nitro'n-Fr. Ex. Lbs.
Alfalfa	1,650	270	2,710	3,720
Crimson clover	1,465	57	894	1,070
Cow peas	465	66	660	1,200
Soy beans	462	156	669	1,158
Or an average per acre of	761	137	1,233	1.787

One ton of wheat bran contains:—

Protein.	Fat.	Fiber.	Nitro'n-Free Ex.
Lbs.	Lbs.	Lbs.	Lbs.
322	90	160	1,090

or, the average yield per acre of protein in these crops, is 2.36 times greater than in the wheat bran, the fat 1.52 times greater, and the nitrogen-free extract 1.64 times greater.

The Money Saved.

On the basis of cost, very interesting relations are also shown. The average cost per acre of the total nutrients obtained in the protein crops was $12.62. The average cost of a ton of wheat bran at the present time will probably not vary widely from $22. Or, in other words, $1 invested in the group of the protein crops will secure:—

Protein	60.3 lbs
Fat	10.8 "
Fiber	97.7 "
Nitrogen-free extract	141.6 "

$1 invested in wheat bran will secure:—

Protein	14.6 lbs
Fat	4.1 "
Fiber	4.2 "
Nitrogen-free extract	58.2 "

Or, $1 invested in the protein crops will purchase over four times as much protein, twice as much fat and two and one-half times as much nitrogen-free extract as is obtained from wheat bran for the same money.

It will be seen, therefore, that the advantage from the standpoint of total nutrients is clearly with the protein crops, and more than sufficient to counterbalance the possible increase in digestibility of the wheat bran, and it is more than likely that the farmer distant from centers of population, may be able to reduce the cost of his nutrients in the protein crops, while on the other hand the cost of his wheat bran may be increased, because of the greater cost of carriage.

The final point to consider, therefore, is in how far these more bulky protein crops may be able to substitute such products as wheat bran, mainly to supply the needed protein. Experiments have been conducted at a number of experiment Stations to test this point, and the results have been as a whole very concordant, though I shall quote only those that have been conducted at our own Station, as they have a more direct bearing upon the particular point at issue.

In 1901, the first experiment was conducted in which four animals were fed 60 days, in two groups, in periods of 15 days each, with ration No. 1, made up of:—

Silage	35 lbs
Alfalfa hay	11 "
Mixed hay	6 "
Cottonseed meal	2 "

No. 2, made up of:—

Silage	35 lbs
Mixed hay	6 "
Wheat bran	4 "
Dried brewers' grains	4 "
Cottonseed meal	2 "

The composition of the two rations was practically identical, so far as the protein was concerned, though the dry matter in the alfalfa ration exceeded that in the mixed grain ration. The main difference in the two rations was, therefore, the substitution of 11 pounds of alfalfa hay for eight pounds of an even mixture of wheat bran and dried brewers' grains.

Without going into details, which may be found in our bulletin No. 148, suffice it to say, that the mixed grain ration, which cost 15.38 cents, or 27.3 per cent. more than the alfalfa ration, produced but 4.5 per cent. more milk, and 6.7 per cent. more butter than were produced from the alfalfa ration. Thereby reducing the food cost of milk from 70.7 cents per hundred to 58 cents per hundred, and the cost of butter from 14.3 cents to 12 cents, illustrating very clearly that alfalfa may substitute a part of the protein feeds, not only, but in so doing reduce the cost of the product.

In 1902, further experiments were conducted and reported in bulletin No. 161, in which alfalfa, crimson clover hay and cow pea silage were substituted for the purchased feeds. In the alfalfa experiment, the home-grown ration was made up entirely of alfalfa hay and corn silage, namely, 13 and 30 pounds, respectively, and compared with a feed ration made up of:—

Silage	30 lbs
Mixed hay	5 "
Wheat bran	6 "
Dried brewers' grains	5 "

The alfalfa used in this experiment was richer in protein than that previously used, and this combination of hay and silage furnished practically the same amounts of protein as were contained in the feed ration. The feeding period was 32 days.

The result of this experiment, so far as yields were concerned, were practically identical with the one just reported, namely, that 4.15 per cent. more milk and 4.16 per cent. more butter were produced from the feed ration than from the alfalfa ration, though the cost of the alfalfa ration was but 13.6 cents, and of the feed ration 21.3 cents, or 56 per cent. greater, making the feed cost of 100 pounds of milk, with the food ration 83.9 cents, and with the alfalfa ration 55.9 cents, and the cost of butter 16.7 cents with the feed ration, and 11.1 cents with the alfalfa ration. Or, in other words, the use of the purchased feed ration caused an increase of over 50 per cent. in the cost of both milk and butter.

Crimson clover hay was also used in another experiment the same year, to substitute the feeds in the ration already referred to. This ration consisted of 16.4 pounds of crimson clover hay and and 30 pounds of corn silage.

The results of this experiment, showed that the feed ration produced 18 per cent. more milk and butter than were produced by the crimson clover hay ration, though valuing the crimson clover hay at the market price, namely, $12 per ton, there was a very considerable saving in the cost of the milk and butter produced, namely, for milk, from 89.5 cents per hundred, for the feed ration, to 71.2 cents per hundred for the crimson clover hay ration, and for butter from 18.19 cents per pound to 14.46 cents per pound.

If the cost of the crimson clover hay ration had been calculated from the actual cost of the hay, rather than at the selling price, the cost of the home-grown ration would have been reduced by 6.56 cents, or to 78 cents per day, making the feed cost of 100 pounds of milk 38.7 cents, instead of 71.2 cents, or making the cost of the product from the feed ration more than double the cost of the home-grown ration.

Value of Cow Pea Hay.

Another experiment conducted the same winter, in which cow pea silage and crimson clover hay, were substituted for the feeds, and corn and cob meal, another home-grown product, used to supply the carbohydrates furnished by the silage, was carried out, and with quite as satisfactory results. In fact, more satisfactory from the standpoint of yield from the home-grown product, as the yield from this ration was slightly larger than that from the feed ration. While the cost was also reduced, though this was necessarily estimated, as it was impossible to determine the exact losses that occurred in the making of the cow pea silage, and known to be considerable. Nevertheless, the point that these products can be substituted for the concentrated protein feeds on the market was clearly demonstrated.

In 1904, an experiment was conducted in which cow pea hay was substituted for the concentrated feeds in a ration for dairy cows, the rations used being from home-grown products: 17 pounds of cow pea hay and 36 pounds of corn silage. The feed ration made up of:—

Corn silage	36 lbs
Cut corn stalks	5 "
Wheat bran	4 "
Dried brewers' grains	3 "
Cottonseed meal	2 "

In these rations, as in the other cases, the aim was to supply practically the same amount of total nutrients, though the home-grown ration continued a larger amount of dry matter than the feed ration. This experiment continued through a period of 36 days, and the results were as follows:—

	Cost.	Yield of:		Cost to produce: 100 lbs.		1 lb.
		Milk.	But.	Milk.	But.	
	Cts.	Lbs.	Lbs.	Cts.	Cts.	
Cow Pea Hay Ration	9.42	1,421.1	64.05	39.80	8.82	
Feed Ration	15.52	1,539.0	73.84	60.51	12.60	

As in the other cases, the total yield of milk was greater from the feed ration than from the home-grown ration, though the cost of the feed ration was much greater, making the cost per hundred of milk and per pound of butter over 50 per cent. greater than for the home-grown ration.

These experiments, while they show that pound for pound the nutrients combined in the home-grown products are less digestible than those obtained in purchased feeds, the lower rate of digestibility is not sufficient in any case to make the cost of product greater, but was in every case sufficiently high to reduce the cost of the animal products obtained from 50 to over 100 per cent.

One point that has not yet been clearly settled in reference to the matter, is whether the continued feeding of so large a proportion of roughage as must be used, in order to supply the nutrients in sufficient amounts and in good proportions, would have any unfavorable effect upon the health and vigor of the animal. So far as the experiments were concerned, there was no apparently unfavorable influence, and experiments are now in progress to study this point more fully.

Unfortunately, too, we have no data in the Eastern States in reference to the substitution of these products for concentrated feeds, in the making of beef or mutton, or in the raising of young stock, though abundant proof from many Western States, where alfalfa is a leading crop, of the advantages in the making of beef and mutton, and I have no doubt that the principles which have proven true in the feeding of dairy cows would be applicable in the feeding of beef.

The points of practical importance that have been established, are that the growing of these crops is entirely practicable, that they may be produced at a cost much lower than now has to be paid for the same class of nutrients in concentrated feeds, and that their substitution for those feeds in rations will result in a reduction in the cost per unit of product. It only remains for the farmers, who have not practiced this method, to learn all they can concerning the crops suitable for the work, and to experiment themselves under their own conditions.

DISCUSSION.

A Member: The majority of farmers practice practically the four years of rotation—followed by oats, oats followed by wheat and corn wheat followed by grass. Now, would it be practical for the farmer to raise Canada peas and oats instead of an oats crop, and follow the Canada peas and oats with cow peas without disturbing the cereal crop or straw crop, which should be either wheat or rye? Would the cow pea crop make it too late and should that cow pea crop be made into hay or profitable silage? If it could should it be mixed with corn or would it pay a man to put it in the silo or harvest with the cow pea crop, taking into consideration the fact that the season might be late and might make it very difficult to cure the hay?

Prof. Voorhees: Our results show that the cost of nutrients in the oat and pea hay is much less than if the oats were ripened and the peas and oats were threshed and ground. That is, we get as large an amount of digestible nutrients at a lower cost by making it into hay. We have also shown that if it is made into hay it can be harvested the latter part of June with us—anyway by the first of July with you. Then by seeding immediately and without plowing the ground—stir up the surface and sow cow peas and then if your season is good, and the period from July 1st on is, of course, the warmest period of the year, they will mature sufficiently to make hay the first week in September. That is the practice we have been using for a short time.

Then follow with your rye. By this method you have gained one crop, and ordinarily that crop will give you at least a ton and a half of cow pea hay, which is worth about as much practically as a ton of wheat bran. You have the hay, but you have a better source of protein from your oats and peas. You have improved the land for the rye or wheat that follows.

Experiments have been conducted in several of the southern states and abroad as to whether it is better to remove the cow peas or plow them under for the seeding of wheat or rye as compared with manuring, and they have found that it is much better to remove the crop. The following crop is better than if it had not been removed, and quite as good as if the crop had been manured or fertilized in the ordinary way. I think that is a very desirable modification of the old practice of four years' rotation, because it brings in one protein crop, brings in another nitrogen gathering crop which has the value of increasing the store of home-grown protein as well as conserving the fertility elements in adding to the nitrogen substance in the soil. I think it is a very desirable thing. Where you raise your oats and thrash them you don't get any more but increase your labor. You will get more good out of it if you make it into hay.

One point I ought to call your attention to: That is, the difficulty that sometimes we have in making the cow pea hay, soy bean hay, or alfalfa hay, because it is a leguminous crop and very watery. It has to be handled carefully because in the handling when it is drying the best portions are lost. It has to be handled when it is not too dry so as to prevent loss of that sort. And sometimes when you harvest your cow pea hay in September the weather is not very good, then it is a question whether you should put it in the silo or make hay of it. If the weather is too bad put it in the silo, though it does not make the best kind of silage, for when it is digestible and palatable it has a peculiar odor. But it seems to me whether it should be put into the silo or made into hay depends upon the time you want to harvest it. There is another advantage in having the hay—you can adjust the proportions in your ration much better than you can in the silage form.

A Member: It is a serious question with us. We have no oats for our horses unless we go outside and buy them, which the farmer objects to. It is a considerable expense. can we take that crop of pea and oat hay and make it answer for the feed of the horse?

Prof. Voorhees: For ordinary farm work it is quite as good.

A Member: What would you say of thrashing your oats and pea hay and grinding it?

Prof. Voorhees: That is all right but it costs you more and you lose your time, and time is an important factor then, for if you get into the middle of July which you will have to do, you lose time, and you do not get any more nutriment and it costs you more money. That is our experience. I think it is the experience of others. It is very nice to have oats and peas ground and it is a very good thing.

A Member: Do you think if you take off the cow peas and stir up the ground it would be sufficient instead of turning it?

Prof. Voorhees: Yes.

A Member: Would it be better to stir it?

Prof. Voorhees: Yes. We plow only once a year.

A Member: In the spring would be the only plowing you do?

Prof. Voorhees: Yes.

A Member: How much oats and cow peas do you raise to the acre?

Prof. Voorhees: Oats and Canada peas mixed together? That depends upon your land. Over here in Pennsylvania you should raise two tons, with us a ton and a half of hay.

Mr. Lantz: I belong to that class of practical farmers who must make their bread and butter out of their farm. I have been quite a student of the relative value of the food ration for sometime, and a few weeks ago I had a fresh Jersey cow three years old which I had been feeding with five quarts of equal parts ground corn, oats and bran, and the roughage was of corn stover. I was getting from 38 to 41 pounds of milk per day. I wanted to get as near 50 pounds of milk per day as possible, and I omitted the corn stover and gave her all clover hay, nice well cured, and alsike for roughage, and to my surprise the flow decreased about four pounds per day. I put her back to the corn stover and she went back to the flow of 38 to 41 pounds. Now, what I want to know is, where did I make my mistake in the changing of this ration, substituting the protein or clover hay for corn stover, and what should I have done or could I have done to have increased the flow? These are practical things that come up. I thought I was going to increase the flow by feeding the clover hay in place of the corn stover, but to my surprise the flow decreased. When I put her back to the old ration she was all right.

Prof Voorhees: How many days did you keep her on the clover hay?

Mr. Lantz: About five days; kept going down all the time.

Mr. Dietrich: The shock to the animal system in making a change from one food to another. Five days will just do such a thing as that. If you had tried it for five weeks you would have found a different state of things.

Mr. Lantz: I did not ask the question to puzzle anyone. I asked for information. I am a student and wanted to learn.

Prof. Voorhees: We have found that to be true in all of our experimental work. We have what we call the transitional period of ten days, so that the shock may be overcome in changing from one ration to another. And we always find that at least if we make a change of rations that is radical, there is very often a decrease in the flow of the milk; it may be the other way, but if you continue that feed for a week or ten days you will find things get all right.

A Member: Have you had success in growing alfalfa? It is a wonderful crop if we can only raise it. This last summer my attention was called to a growing field of alfalfa quite successfully, and the owner was feeding shoats. I think it was in June, and they were in poor condition at the time. He put them in his barn and fed them on nothing but alfalfa hay and water and those shoats, according to his description, grew in weight on nothing but alfalfa. We can't grow it on account of being choked out by the natural grasses and weeds. I want to know if you have any experience in this line, whether that would the grown successfully.

Prof. Voorhees: That is one great difficulty we have in spring seeding the summer grasses, those summer weeds, so that I am rather inclined to believe that the best time to seed is in the latter part of July or the first of August. If you get your ground well covered you don't have the summer weeds to interfere with you, and while the first crop next year will not be so good as if seeded the year before, nevertheless you don't lose the use of your land for a year. So that I am rather inclined to recommend that the seeding be made about the first week in August. Last year we seeded several areas, beginning with June; I seeded an area every month beginning with June,—June, July, August and September; and the July and August seedings were exceedingly favorable; the June seeding was a failure and the late September seeding was also a failure. I expected it would be. But I am very strongly in favor of the attempt of the farmer to grow alfalfa. I believe it is going to be one of the elements of salvation to our eastern dairymen.

Now, this question of whether you can grow or cannot grow depends largely upon the man. There is no patent upon it. When we started to grow it we didn't inoculate the soil; we didn't know very much about it.

A Member: Down in New Jersey they call Prof. Voorhees the Alfalfa and Omega of agriculture.

A Member: There is a farmer in our section who has mixed alfalfa seed with his other grass seeds every year for the purpose of trying to inoculate the soil in that way. Would you recommend that?

Prof. Voorhees: Well, there is a farmer in our town who has been very successful just in that way, and I regard that as rather a nice way to begin. He is a farmer who has grown alfalfa for several years and gets an excellent crop. I don't think he had quite as large a yield, but he has simply seeded his wheat with that alfalfa instead of clover seed. When he seeded his wheat he sowed alfalfa and timothy.

A Member: Sowed them together?

Prof. Voorhees: Yes, in the fall. Did it along in the latter part of August. I know the history of that case. I know exactly what he has got. That man got about two and a half times what he could have gotten from his ordinary grasses. He was successful in getting it through the winter. Now, he cuts alfalfa, timothy and clover about the 20th of June. Then he gets the next crop about the first of August, somewhere along there, and then pastures from that on until winter, and last year he got four tons and a half of splendid hay. I know it because I bought it from that farmer. He was foolish to sell it, sold to me for $14 a ton. It is excellent. It is a good way to start, as it is not expensive. A great many people might start and prepare thin land aud quite a great expense for fertilization and lime and all that sort of thing and fail, and that might discourage them forever.

A Member: Has he followed that long enough to prove to his satisfaction his crop is improved by the inoculation that my friend speaks of?

Prof. Voorhees: No, I think not that. He has grown alfalfa on his farm and perhaps the soil is inoculated. I am not a disbeliever in this inoculation. I believe we are going to be misled in this matter of inoculation by some of the statements made. Farmers get a notion it is a question of inoculation and not a question of good preparation of the soil. Now then the successful inoculation is likely to follow in that soil which has been well prepared, so that you don't want to let up a minute on the preparation of the soil, the inoculation, the fertilizers and things of that sort.

A Member: I am glad to endorse Prof. Voorhees on that subject. I think he is perfectly right in saying there is a good deal in the man. I was as much of a believer in alfalfa as anyone. I tried to grow it for several years and failed it entirely, and after reading up carefully I tried it again. I tried it last year and as before stated here, made a perfect seed bed, cultivated thoroughly and I sowed it just at the time Prof. Voorhees recommends, about the second week in August. I have got just as good a stand of alfalfa as any one would want to see. I sowed about 28 or 30 pounds to the acre. I drilled pretty heavy and I put it in with the corn drill so that it would be evenly distributed and is is entirely satisfactory. I believe all farmers here in eastern Pennsylvania can grow alfalfa if they want to. It depends entirely upon this preparation of your soil.

A Member: Wouldn't the manure furnish the necessary bacteria to inoculate the soil?

Prof. Voorhees: Not always, no. It will make a better soil for the development of bacteria.

A Member: Would you drill the cow peas in sow broadcast?

Prof. Voorhees: I think possibly drilling would be better, you get a larger yield. We do both.

PROFITABLE TYPES OF LIGHT HORSES

By Dr. George M. Rommel, Bureau of Animal Industry, U. S. Department of Agriculture.

AFTERNOON SESSION.

President Norton called the convention to order at 1.30 P. M.

President Norton: The first thing on the program this afternoon is an address, entitled

"Profitable Types of Light Horses."

Mr. President and Members of the Pennsylvania Live Stock Breeders' Association:, In discussing profitable types of light horses, I want to speak on those types or classes of horses that are profitable from the standpoint of the man that takes them to the market and sells them. By a profitable light horse we understand then a horse that will pay the breeder for producing him when he takes him down to the place where the horses buyers congregate and pay good money for good animals.

There are three general classes of light horses on most markets: The roadster class, the carriage class and the saddle class. They are known under different names. The roadsters are known as drivers, gentlemen's drivers, light drivers or roadsters as the case may be. Carriage horses are known under such names as carriage horses, carriage teams, coach horses, coachers and actors, etc. Under the class of carriage horses there are two general sub-classes: Cobs and Harness ponies—neither one of them very numerous in any of our markets, but both profitable classes. Under saddlers, there are a number of sub-classes, but those classes are of importance principally as matters of general information than as actual sub-divisions of the market. Before going into the characteristics of these different classes, I want to speak briefly on the characteristics that are common to all classes of light horses which, speaking broadly, may be applied to all classes of horses, regardless of whether they are light or heavy, by means of which you can build up in the mind's eye the perfect horse. The variations from this make the characteristics of the different classes.

Perhaps the first and most important essential in a market horse is soundness. It is absolutely useless to expect to sell a horse that is unsound for a good price on any critical market. Unsoundnesses that are most common are those of the limbs and the respiratory organs. A marketable horse should not have a splint so high up on the leg that it interferes with the articulation of the knee joint. A splint may be small and low down and not seriously affect the selling price of the animal. Understand, however, that where you have to consider the highest type of equine beauty you want to avoid blemishes just as much as possible. A splint at best is a blemish, and naturally will result in a discrimination being made against a horse possessing one when he is sold. With light horses everything that is an offense to the eye must be avoided. The more beautiful a horse is, other things considered, the higher he is going to sell. There must be no ringbone, no side-bone, or other unsoundness of the feet, and in the hind legs no curb; no spavin, no thoroughpin or bog spavin; of course, he must not be a roarer or wind-broken. Now, most of these things are unsoundnesses that can be readily detected by any one who is at all competent in judging horses.

Conformation.

The next point is conformation. The conformation of the profitable horse is one that must be learned with a great deal of study. The head should be well shaped, neat, clear cut and straight, with breadth between the eyes, a large, open nostril, fine cut muzzle, and clean, firm lips, a full, bright eye, a neat, well set ear of medium size, a clean cut, open jaw, with a wide angle between the jaws, that is, the jaws should set out rather than in, the jaws should not extend so far back that when a curb bit is put on the horse the jaw itself will press against the wind-pipe and interfere with his breathing. We must have a clean cut throttle, a neck of good length, clean cut and well muscled, a clean cut wind-pipe, high withers, and a sloping shoulder without any tendency to meatiness. The arm should be thrown well back, the forearm long, well muscled, and flat; knees good-sized, cannon clean cut and strong, with tendon well defined; straight fetlocks, sloping pasterns, feet of fair size, with dense horn, with high and wide heels. Now, that short back is a something that will fool a beginner in a good many instances, because if the horse has a straight shoulder his back is going to look longer. The back must be short, strong and straight, with the ribs deep and well rounded, the chest deep and the loins broad and strong. In the hind quarters there must be good breadth or croup, which should be straight rather than strong. the quarters should be well rounded, smooth, well muscled, and muscular, the thighs long, with open angles, the lower thighs should be long and well muscled. The hock—the most important joint in the body—should be wide, deep and clean cut in front; at the back the hock should come up to a rather fine edge. The cannon should be clean cut, cordy, the tendons standing out distinctly, and the bone should be clean. The fetlocks should be wide and deep, pasterns sloping—not so much slope is necessary in the hind pasterns as in the front ones. To ascertain the straightness of the legs stand immediately in front of the animal and drop an imaginary plumb line from the point of the shoulder; it should divide the leg from the knee down. At the side aline from the center of the arm should fall on the center of the foot. A line dropped from behind the point of the buttock should bisect leg from this point down; from the side this line should touch the back and coincide with the cannon throughout its length.

The point of quality is extremely important and hard to describe because it is a very intangible thing. The horse should have a clean cut appearance throughout; there should be a cleanness of bone, no meatiness below the knee and hock or around the shoulder. The head should be clean cut, and he should have a general well-bred appearance. His skin should be moderately fine and the hair soft.

Action and Style.

The point of action is the next in importance. Action is extremely important in light horses. It should be straight and true. At the trot it should be what is known as the straight line trot, no wabbling from one side to the other, or swinging the feet. The action from behind should be straight, the feet picked up smartly, hocks well flexed, and the feet of both fore and hind legs at each step placed immediately in front of the former position.

Style is of the highest importance, and this is generally indicated by the way in which he carries his head, the general appearances of smartness, of good disposition, and nerve.

Then we have the point of manners. No horse is going to sell well in any of these classes that is not well mannered, or shows that he has had no education. I do not mean by that that he should lack spirit because he must have spirit, but he should have been taught how to behave himself in the case of emergency. This is especially true in the cases of horses that are sold for city use. A great many horses are very sharply discriminated against on this point.

The last point is that of condition. You know, of course, that if you send a steer to market that is not fat you are not going to get as much for him as you would if he was fat. To a certain extent the same thing is true of horses. It is not so true of light horses as much as with drafters, but a horse out of condition will not sell within twenty-five per cent of what he might sell for if he was in good condition. He should not be over-fed or over-fat, but he should have meat enough to cover his bones and make him look well fed and smooth.

Taking up the classes in greater detail let us begin with the roadster. The roadster class in size should be up to about sixteen hands, althought a great many very good roadsters or drivers are sold that are much lower than that, down as low as fifteen hands. The sixteen-hand horse, other things considered and being equal, generally will sell better than the small horse. A sixteen-hand roadster should not weight over 1,150 pounds. Roadsters have an angular and rangy appearance. The speed of the roadster should be about ten to fourteen miles an hour, but the more you can get the better, because speed adds materially to the value of a horse provided he has good conformation and true action. Condition is not as essential in the roadster class as it is in some other types—the carriage class is more important as far as condition is concerned of any of these light classes. There is not a great deal required in the way of showy action in this class. The horse must have a straight line trot, a frictionless trot. That is, he must move smoothly. There must not be any shakiness in his gait. The joints must work smoothly. You know what is said of the late Belle Hamlin. She seemed to fly like a bird when she moved, and some authorities regarded her action as one of the greatest models of the smooth, frictionless trot. Then the roadster must have the ability to extend himself, that is, the gait or stride must be long and not short or choppy or cut up. In the pacer, of course the action is different, but the same principle of straightness and lack of friction applies.

The walk is a point that breeders of horses have a tendency to neglect. You cannot trot a horse all the time if you are going to use your animal on the road. Therefore, you want one that has a rapid walk, and that can carry you along at a good pace when you do not feel like urging him into the trot. The walk should be regular and balanced, the steps taken in regular order, and it should be rapid and quick with a good long stride.

A member: Have you seen many horses that could walk well when short rigged.

Prof. Rommell: I am not speaking of the speed trotter now. I am speaking now of the horse that is useful from the market standpoint.

The Carriage Horse.

The model carriage horse should be up to 16 hands and should weigh about 1,200 pounds. He should be more compact in conformation than the roadster, more muscular, rounder in body and smoother. Here is where condition comes in. Condition is thus highly important in this case. There should be ability to pull a considerable load, and for this reason we look to the muscular feature. The muscularity of the hind quarters is especially important; a sloping rump, low seated tail, and cat ham are very objectionable in a carriage horse. Other defects that must be guarded against are big heads, thick, short necks commonly known as bull necks, and meaty withers and shoulders. A great deal of speed is not required in this class of horses; from eight to ten miles an hour is plenty of speed. However, if your carriage horse has the conformation that is required for the class, and has considerable speed in addition he will sell just that much better.

Subclasses of this class are the cob and the harness ponies. A cob is nothing but a fifteen-one hands carriage horse, weighing from 950 to 1,050 pounds, and suitable for rather light vehicles such as ladies' carriages. Harness ponies are horses from fourteen-two or fourteen-three hands and under, with all the characteristics of the carriage horse. These little fellows frequently sell for as much as the large horses.

Saddle Horses.

Saddle horses are primarily weight carriers. They are not intended to pull a load, and for that reason the conformation is quite different from that of the other type. The points of most importance are sloping shoulders, light, clean cut withers, short back, and muscular hind quarters. In addition to this there must be plenty of bone. It is not necessary that the saddle horse is as high as one of the other classes. A sixteen-hand horse is not necessarily a saddle horse. Very few men want to ride a horse that is that tall—it looks further to fall off, if one must get off in a hurry. Further, if the horse stands fifteen-two hands, he must have depth of body rather than length of leg. The bone of the leg should be abundant and strong, of good quality and dense. Broad loins are also of great importance here. The walk trot and canter saddle horse is the three-galted horse

that is generally known as the park saddler on the market. These horses are produced very largely in this country by taking good gaited sadule horses and neglecting to educating them in the rack or single foot. Many of the best horses that we have for this purpose are produced in that way. The gaited saddle horse is the five gaited horse, having the gaits required by the American Saddle Horse Breeders' Association. I might mention briefly the characteristics of hunters and polo ponies. Hunter horses as you know are those used by gentlemen of wealth and leisure hunting across country after hounds. For this purpose it is necessary to have a horse with considerable fore hand, that is depth of chest and depth of body, with very well muscled hind quarters. Hunters are generally divided into three classes, heavy weight, middle weight and light weight. A heavy weight hunter stands fifteen-two to sixteen hands and weighs at least twelve hundred pounds. Of course, for a very heavy man a heavier horse than that would be necessary, but this kind of a horse can easily carry a man weighing about one hundred and ninety pounds. The middle weight should stand from fifteen-one to say fifteen-two and weigh from eleven hundred to eleven hundred and fifty pounds. The light weight hunter weighs about one hundred and fifty pounds less. Let us consider briefly some points regarding the relative economy of production of these different classes. In 1904 the average prices on the Chicago market for the different classes of light horses were as follows: Carriage teams, $475.00 per pair; drivers, $150.00 per head; saddle horses, $160.00 per head. The price per head for carriage horses would thus be $237.50 each, so you see that it is considerably more valuable than either of the other classes. In the five years from 1899 to 1904 inclusive, carriage horses have increased in value much more rapidly than either of the classes. The increase in value per head has been $32.50 as against an increase of $10.00 per head in the other two classes.

The Government Stud.

In this connection it may be of interest to the audience to refer briefly to some of the plans that are on foot for the production of a breed of carriage horses in this country from American material on an American foundation. The Department of Agriculture has recently inaugurated some experiments along this line in co-operation with the Colorado Experiment Station at Fort Collins. We have purchased a few horses and the plan of the experiment is to develop a breed of horses to satisfy the demand for carriage horses in this country. I have called your attention to the fact that the increase in value per head in five years has been three times as fast in the case of carriage horses—more than three times as fast—than that of roadsters or saddle horses. It has also been greater than the increase in value per head of draft horses, in spite of the improvement in business conditions, the increase in value per head for draft horses on the Chicago market in five years being $22.00. Now that increase has been due to the fact that the country does not have a supply of carriage horses to meet the demands made on the market. The supply has been largely obtained in past years by sending over the country looking for horses that will fill this class, and the horses that they have generally obtained have been those that are to a certain extent standard bred, that is they are by standard sires, (in many cases they are standard on both sides). These horses have been sent to the market and docked (if they were stallions they were usually castrated), and turned into heavy harness horses. So far as we have been able to find out. There has been no systematic attempt to formulate a breed by means of this material, and the market has been drawing this class of horse constantly from the breeding field with the result that as time progresses, the opportunity for demonstrating the value of the native blood and developing a breed of American carriage horse is constantly slipping from us and the country is presented with a situation somewhat analagous to that when the Connestoga draft horse and the old Morgan type began to decline.

The Department's work in this respect has a wider consequence, perhaps, than the interests of the horse breeder alone. If a breed of horses can be developed to fill this demand, it means that breeds of other classes of stock can likewise be developed. One of the most hopeful indications of the possibilities of the country in this respect is the success of the American farmer in developing breeds of hogs that are suitable to his own conditions You heard Mr. Lovejoy tell this morning how his herd was champion over all others at the Columbian Exposition.. We have produced our own breeds of hogs in this country on the foundation of the British breeders and by means of our own material, and these breeds of hogs are racially distinct. Furthermore, the breeders of beef cattle, in one instance certainly, perhaps in two, have reached a standard of excellence that is far ahead of anything done abroad and breeders of dairy cattle have in some instances surpassed the best that has been produced in other countries. Furthermore, we have in this country in the American trotter. the fastest and gamest breed of light harness horses in the world. The farmer can profitably produce light horses if he will breed for the very highest type. There are most difficult classes to breed for, for the reason that there is so much more to be considered. You must consider the appearance of the horse. his style, his action and suitability for the purpose for which he is bred. In addition you have to consider that point of soundness. There must be no "practical" soundness or anything of the kind. The light horse must be sound or he goes into the cheap classes.

If some of the gentlemen present have questions. you may bring out points that I have neglected in the presentation of this subject. At any rate, I thank you for your kind attention.

Cavalry and Artillery Horses.

A member: Tell us something about the cavalry type.

Prof. Rommel: I would not like to address an audience of farmers on the cavalry type of horses for this reason: The War Department will not pay profitable prices for the horses that they want for use in the army. It does not pay the farmer to breed for this type. The cavalry horses in the country are obtained in two ways: The first by purchases on the large markets such as Chicago. Kansas City, St. Louis and Omaha. Those horses are bought up over the country; they are practically misfits which could not be sold to advantage in a profitable market class. They are not showy enough, not handsome enough to make good carriage horses or good saddle horses, or they are too light. A second source of supply is the western range country where horses are produced in large numbers at minimum cost. Many of our army horses are bought there. The range breeder is the only one who can profitably breed for the cavalry or artillery. They are paying a better price now for cavalry and artillery horses than they have been in the past.

A member: What do they pay?

Prof. Rommel: Last summer as high as $225 was paid for artillery horses. That is a good price for them. Artillery horses usually have some draft blood in them. They can be produced by breeding small draft stallions on the ordinary run of farm mares. If one gets $225 for that kind of horse, it is one of the best. The War Department does not want draft characteristics in the cavalry horse. If the horse has good qualities of conformation, size, soundness and action, and is a handsome animal, the farmer will get much more for him from the regular market than from the army. Don't misunderstand, if he fills the bill called for by the army regulation a horse of the highest conformation will sell for two or three times as much as a saddle horse or carriage horse which he would as an army horse.

A member: Doctor, do you think it is safe to breed from a horse of a nervous temperament?

Prof. Rommell: It depends upon what you mean by nervous temperament.

A member: Do you think it could be overcome?

Prof. Rommell: It depends upon circumstances. Some horses seem to be of very nervous temperament when they are not so as a matter of fact. I don't think that the question can be accurately answered. The personal equation is just as important in the case of the driver as in that of the horse. Some persons can easily handle nervous horses. whereas others can do nothing with them. You may have noticed instances where a man would go driving and his horse would be almost pulling his arms out in a few minutes, but that man's wife may drive the same horse and have no pulling at all. Most of the horses that are shown in the horse shows have very nervous temperaments, and they must be handled only by persons who are familiar with them.

By Mr. Bayard: How should a saddle horse carry his head?

Prof. Rommell: Personally I prefer the peacock variety. We have had a judge at Madison Square Garden for several seasons who goes in for the Thoroughbred type. I think the average American prefers the peacock variety. The horse should carry his head and tail up, without any artificial stimulus. The manner in which he carries his head is very important. The neck should set out well from the shoulder. The neck is more or less straight in the Thoroughbred type.

A member: What would you do with a bucking horse?

Prof. Rommell: Kill him.

At this point in the proceedings the reports of committees were taken up.

The report of the committee appointed to audit the books reported as follows:

"We have audited the accounts of the treasurer, and find there was $29.95 remaining in the treasury."

It was moved and seconded that the report be adopted.

Carried unanimously.

It was moved that the president appoint a committee of five to confer with other organizations and protest against the repeal of the Grout bill. Motion seconded and carried unanimously.

Officers were elected as below:

President, W. C. Norton, Aldenville; first vice-president, Dr. Leonard Pearson, Philadelphia; second vice-president, M. P. Shoemaker, Greensburg; secretary, E. S. Bayard, Pittsburg; treasurer, J. F. Lantz, Glenmoore.

Executive Committee: W. G. Powell, Shadeland; M. N. Clark, Claridge; D. Norman App, Selinsgrove; William Berry, Washington; Geo. C. Watson, State College; James Blair, Hartstown.

Legislative Committee: Dr. Thomas Turnbull, Allegheny; H. W. Comfort, Fallingston; R. L. Munce, Canonsburg; J. H. Reichert, Scranton; S E. Nivin, Landenburg; Henry Palmer, Avondale.

Committee on Transportation: T. E. Orr, Beaver; Dr. J. Cheston Morris, Philadlephia; W. F. Shrum, Adamsburg; Jos. T. Fleming, Belleville; J. Grier Dain, Malvern.

Committee on Fairs: W. C. Black, Mercer; Jas. Blair, Hartstown; J. L. Henderson, Washington; J. D. Detrich, Flourtown; L. D. May, Granville Center; W. E. Perham, Niagara.

It was moved and seconded that the executive committee be authorized to act upon the next meeting place and time.

Carried.

It was moved and seconded that the association, through Mr. Bayard, tender the stenographer who has helped Mr. Bayard so in his work, a ten dollar gold piece as a recognition of her services which were given gratuitiously.

Moved and seconded. Carried unanimously.

Adjourned.

THE DRAFT HORSE

By Thomas F. Hunt, Professor of Agronomy,
Cornell University.

Mr. President, and members of the Pennsylvania Live Stock Breeders' Association:

As secretary of the New York State Breeders' Association I bring to the Pennsylvania State Live Stock Breeders' Association the greeting of the New York Association. I may also say to you that New York State has a State Fair, and it does not have to tell any lies about it either. And not only do they have a state fair, but they have appointed a committee, of which Mr. Duncan is Chairman, the gentleman who spoke last evening, whose object it will be to hold in connection with this State Fair a winter meeting, such a meeting as you are now holding a winter fair, fat stock show. We invite, you, our neighboring state, to attend our state fair and see that we haven't told any lies about it. We expect to hold it in next December in connection with our winter meeting, and with our fat stock show.

I have been asked by your secretary, who is a good judge of poor material, to present a paper upon the draft horse, before this Pennsylvania State Stock Breeders' Association. It reminds me of the man who was asked to write a paper upon the subject of the Snakes in Ireland. You know what he wrote: "There are no snakes in Ireland." I am not familiar with the conditions in Pennsylvania. but in your neighboring state on the north where I have given the situation some attention, the breeders of draft horses are not unlike the snakes in Ireland.

Indeed, concerning not only draft horses, but horses in general, the North Atlantic States are consumers rather than producers of horses. The North Atlantic States contain more than one-fourth the population of the United States and produces one-seventeenth of the horses required to maintain the supply of horses needed; Pennsylvania contains one-thirteenth of the population and raises one-fiftieth of the horses of the United States.

This chart shows graphically the number of colts produced for each 100 horses kept in the United States and the different division thereof, as indicated according to census of 1900, by taking the number of yearling colts as a basis for such calculation.

It will be noted that in the United States for each 100 horses there are raised annually eight colts. This is the number required to maintain the supply wants of the country plus the exports. The total number of fresh horses required annually is therefore about a million and a half. The North Atlantic States produce but 3.5 colts for each 100 horses; Pennsylvania 5.1; South Atlantic States, 5.6; North Central States, 8.6; South Central, 7.5; the Western States, 12.9 colts. The Western States include those States west of Denver. It is here that the breeding of horses is most active in proportion to horses kept.

In the United States there is one colt raised annually for about every four farms; in the North Atlantic States one colt for every eight farms; in Pennsylvania one colt for every six farms; in Iowa one colt for every two farms.

It is probable that the North Atlantic States consume annually 150,000 horses worth over $15,000,000 more than they produce. It appears probable likewise that Pennsylvania consumes 40,000 more horses than she produces, costing at least $4,000,000.

Buffalo is said to have handled 400,000 horses in 1904. One firm which handled 17,000 horses last year tells me that approximately 15 per cent. weighed more than 1,500 pounds, 15 per cent. weighed less than 1,200 pounds, leaving 70 per cent. between 1,200 and 1,500 pounds. It is safe to say, therefore, that at least three-fourths of these horses possessed more or less draft breeding. I am told the horses received at Buffalo come principally from the North Central States, including especially Iowa, Ohio, Illinois, Nebraska, Kansas and the Dakotas.

From this presentment, it might appear obvious that the farmers of the North Atlantic States, including those of Pennsylvania, should engage more generally in the breeding of horses and especially of draft horses. I believe this is true, but I wish the demonstration was more complete. Certainly farmers of these States should raise more draft horses, unless they cannot raise as good draft horses as their western neighbors, or unless they can make more money doing something else.

Draft Horse History.

We began actively to breed draft horses in the United States about 50 years ago. These operations began in Central Ohio and have moved westward until the whole of the Central West has become permeated with horses of draft breeding. During the half century that has elapsed, the draft horse has appeared unable to make its way eastward to any considerable extent except to be consumed. Has this been due to habit or to the lack of suggestion? Has the accident of introducing the draft horse into a pioneer country been the cause of its western development? Have the eastern farmers been making so much money during the half century that they could afford to allow the Western farmer to supply the needs of our Eastern cities with draft horses, not to mention other classes of horses? Or is the reason more fundamental?

One thing is certain, that the phenomenal development of the Central West has been in larger measure related to the application of efficient motive power to the production and marketing of farm crops. The draft horse has been a factor in this development. The efficiency of the horse as a motive power has been raised to such an extent as

to reduce the number of horses required to do a given amount of work. It may be questioned whether the increase in efficiency of the horses of the United States has not been a greater factor in influencing the number of horses required than all the railroads, trolley lines, automobiles and bicycles. It is interesting in this connection to quote an item which appeared recently:

"The New York subway, which is carrying three hundred and fifty thousand passengers a day, has not decreased the travel on the elevated railroads, and has affected only slightly that on the surface cars." The new East River bridge which was opened to car traffic a few weeks ago carries crowded cars, and yet the traffic on the old bridge remains practically unaffected. Here are two cases in a single city which prove what observers have long known—that every improvement in transit facilities increases the number of people who will use them, or rather, the same people will ride more when they can ride easily than when the accommodations are inadequate.

Advantage of Heavy Horses.

Whatever may be the condition in the past we must face the facts as we find them. I believe that the eastern farmer would do his farm work more efficiently and more economically if he had larger horses. I believe it would pay some of these farmers to supply the eastern market with high class draft horses. It should not be forgotten, however, that the problem is one of considerable difficulty. If a farmer desires to raise beef cattle or dairy cattle or mutton sheep or fine wooled sheep, he has only to buy the necessary females and a sire and proceed to realize his ideal. As every one knows, in the breeding of horses the farmer cannot cope with the situation individually. In most sections of the Eastern States the chief motive for keeping stallions comes from the patronage of men who breed horses for pleasure and sport. I am not condemning this situation, but it fails in many cases to meet the farmer's real needs, although doubtless he too often breeds to these stallions through the same sporting instinct.

If breeding of draft horses is to be started in a section not heretofore breeding them it should be done by co-operative effort. The farmers of a section should thoroughly canvass the situation as to the desirability of the project for their particular territory. If it is deemed desirable they should enter into an agreement to breed draft horses for at least ten years. Then they should secure a stallion by co-operative effort, not for the purpose primarily of profit from service fees but to make sure of a consistent line of breeding. Unless a neighborhood can enter into the business systematically and thus make itself the center for high class horses, it had better turn its attention to some other business. It must be remembered, also, that unless the neighborhood already has high class draft mares, it will be several generations before the progeny can compete with Western draft horses. If a farmer were assured that for ten years he would have a draft stallion at his service, there would be some incentive to secure high class draft mares. At present no such incentive exists.

Leaving now for your discussion the possibility and propriety of breeding draft horses in the North Atlantic States and particularly in your own State, let us turn to the question of the conformation of the draft horse. And before proceeding to discuss the draft horse as he actually exists in the United States, permit me to present some theoretical considerations which should guide those who develop the draft type. For greater ease in following the discussion, I hand you a score card used in teaching students to become acquainted with and to judge the different types of horses.

Form and Purpose.

Horses are used either for force or for speed, or for both. In every horse, both motion and power are essential but in varying degrees. The thoroughbred and the modern trotter hitched to a pneumatic tire sulky are types of the horse used for speed almost exclusively, while the Shire and the Boulonnais are types in which speed is largely subordinated.

The horse, or other animal, is a complicated system of bones, which act as levers and to which power is transmitted through the muscles. The well known principle of physics that "force cannot be gained without loss of speed and that speed cannot be gained without loss of force," applies equally to the leg of a horse and the drive wheel of an engine. While we may have a fair degree of both force and speed in one animal, we cannot have extreme speed without some loss of force, nor great force without some loss of speed.

If we could have a horse rigid and suspended from the back by a string, we would find a point where the horse would balance. If we should again suspend him from the breast and also from the side, we should find two other such other such points. The point at which these three lines would meet would be the horse's center of gravity. The more stable the horse, the greater the force; the less stable the horse, the greater the speed. The lower the center of gravity, the wider the base represented by his four feet, and the more nearly the center of gravity lies in the center of this base, the more stable the equilibrium, consequently the greater the force. On the contrary, the higher the center of gravity the smaller the base and the farther forward the center of gravity the less stable his equilibrium and the greater his speed. In other words, a tall horse does not run fast simply because his legs are long, but because his center of gravity is high and his equilibrium unstable.

This fact is well shown by the difference in speed between running, pacing, trotting and walking. In running, the horse's equilibrium is the most unstable because his feet are entirely off the ground at certain times—hence the horse is required to make greater effort to restore his equilibrium. This causes him to go faster. In the same way, the equilibrium of the pacing horse is less stable than that of the trotting horse because in pacing, the two feet on one side of the horse are taken off the ground at the same time and the center of gravity consequently falls entirely without the base; while in trotting, feet on opposite sides are taken

from the ground at the same time and the center of gravity is almost in a straight line between the two feet which remain on the ground. The pacing horse, therefore, is required to make greater effort to regain his equilibrium and in consequence goes more rapidly than the trotter. In walking there is never less than two feet on the ground at any time and part of the time there are three.

Force and Speed.

For force, we must have weight in order that a sufficient resistance may be offered to the load which it is desired to move, and also that we may have muscles and bones of sufficient size to obtain the requisite power. For speed, on the other hand, we must have long bones and long muscles in order to have quick motions. A horse that is low and massive also has the bones of his members at a more advantageous angle for force, that is to say more nearly at right angles with one another, while the horse that is high has the bones of his members at a wider angle which is more advantageous for speed.

By attitude is meant the relation of the feet and members to the body. It is obvious to any one who stops to think about it, that the best position for a milk stool is when the bottom of the leg is directly under the top of it, in other words, when the leg of the milk stool is vertical. If it happens that the leg of the milk stool is crooked, it does not change the fact that the bottom end of the leg should be directly under the top end and that the seat of the stool should be at right angles to a line drawn from the top end to the bottom end of the leg. The same mechanical principle applies to horses. The most advantageous position for the feet of the horse is when they are directly under the points of attachment with the body. If the front feet are farther under the body than this, more of the weight of the body is thrown on the front feet and more strain is thrown upon muscles in holding the horse in this condition. Such a horse is likely to likely to pound out his front feet too quickly. On the other hand, if his hind feet are too far under him, too much of the weight is thrown upon the hind members and too much force is required of the hocks. Consequently, the horse is liable to injury at this point. Ordinarily five-ninths the weight of a horse is carried on his front feet and four-ninths on his hind feet. If a plumb line is dropped from the point of attachment at the elbow, the line should just split the knee and pastern joint and touch the ground at the heel of the horse's foot. Likewise, if a plumb line is dropped from the buttock, the line should just touch the rear of the hock and pass parallel and just against the rear edge of the cannon. When viewed from the front, a plumb line dropped from the point of the shoulder will pass directly in front of the middle of the knee and foot. Under these conditions the feet will be usually just far enough apart to allow the placing of another foot of equal size between them. When viewed from the rear, a plumb line dropped from the point of the buttock should pass directly in the middle of the hock and pastern joints. The hind feet under these conditions will be usually just far enough apart to allow the width of the hock to be placed between them. Such an attitude means that the fore arm and all the cannons will be directly vertical. A horse should have this conformation without reference to the purpose for which he is to be used.

Horse Proportions.

In the study of animal proportions, it has been found desirable to adopt some unit of measure. In considering whether a horse has a proper proportion, it is not entirely a question of how many inches high or long, how long the shoulder or neck, or how wide the breast and hips, but it is a question of how the measurements are related to one another. Careful investigation has shown that the length of a horse's head, i. e., a straight line from the nps to the top of the poll, obtained by a compass, not by a tape line, possesses the elements necessary for a unit of measure. It has been found further that there are a number of measurements of a normal, well proportioned horse to which this unit of measure applies. For example, the height of a horse at the withers is two and one-half times the length of his head. If the height of the horse is more than two and one-half times the length of the horse's head, the head will appear small or the horse set up on stilts. If the height is less than two and one-half times the length of the head, then the head appears large and ungainly or the horse is unusually close to the ground.

The ideal distance between the point of the shoulder and the point of the buttock, i. e., the length of the horse's body, is the same distance as the height of the horse at the withers. Except for the head and neck, an ideal horse stands in an exact square. The horse is distinguished in this respect from the ox, which is generally about 20 per cent. longer than it is high. This accounts for the fact that an ox can pull more for its weight but does not have the speed of the horse. The length of our draft horses, as well as our trotting horses, generally exceeds their height by one or two inches, while the height of the thoroughbred and saddle horses sometimes exceeds their length. While it is true that our draft horses, on an average, are slighty longer than their height, our best types approach the square very closely.

The significance of the length of the horse depends upon the proportion of the shoulder, back and croup. If the length is obtained by long, sloping shoulders and a long, horizontal croup, extra length need not alarm us, but if this extra length is to be found between the rear angle of the shoulder blade and the hips, the conformation is not desirable.

The distance from the rear of the shoulder blade and the point of the hips should be in a well coupled horse the length of the horse's head, while the length of the croup is about two inches less. Draft horses, which have been worked for some years, will have the back somewhat greater because of the straightening of the shoulder, incident to the pressure of the collar. It may be here noted that the reason for a stout back lies in the

center of gravity is thereby lowered and thrown backward nearer the center of the base.

The Actual Draft Horse.

So much and too much of the theoretical draft horse! What of the actual American draft horse?

It has come in my way to make a good mny measurements of draft horses, including imported draft stallions. It occurred to me that a study of the conformation of draft horses, as found in actual use would be of interest and perhaps of value. I, therefore, set a student at this work.

The census of 1900 allows Columbus, Ohio, a population of 125,560, and it has risen to the dignity of suburbs. It is a town large enough to support important breweries and transfer companies, in which the keeping of fine draft horses becomes a matter of advertising as well as pride. Mr. A. H. Snyder, of the class of 1901, Ohio State University, measured one hundred and one of the best and largest draft horses to be found in as compared to the running horse, so that in trotting horses, long, weak backs are often found. The bicycle sulky has been the means of increasing the speed because it has reduced the power required, but has resulted in breeding the trotter farther away from utilitarian purposes.

The stoutest croup is a sloping or vertically inclined one, and shortness is no special detriment for force, provided the muscles are large. The long, horizontal croup gives the most speed and the best action; because the muscles are longer; the hind members are longer in proportion to the height of the horse, and because the propulsion is more nearly in the direction in which the horse is going. Inasmuch as the market demands considerable action and some speed, even in its heaviest types, the draft horse with a long, horizontal croup brings the most money, although this conformation causes loss of power.

Among the other lengths of a horse which are the length of a horse's head may be mentioned:

(1) Length of the neck from the poll to the center of the insertion at the shoulder.
(2) From the back to the abdomen.
(3) From the top of the withers to the point of the arm.
(4) From the superior fold of the stifle-joint to the point of the hock.
(5) From the point of the hock to the ground.

It may be useful to know, also, that the width of the head from the forehead to the angle of the jaw and the width of the neck at the junction of the head, should both be the same and be one-half the length of the horse's head.

The length of the shoulder is not, in itself an important consideration for greater strength.

The Shoulder.

The shoulder of a draft horse should present the proper direction for the collar; the proper angle with the arm, which should approach a right angle, and should be heavily muscled. For speed, long sloping shoulders are desirable, with the arm in a vertical rather than a horizontal position. This conformation gives the longest muscles; gives the greatest elasticity, and places the point of the shoulder the farthest in front of the foot, when the latter is upon the ground; enables the foot to be extended more horizontally, and hence is longer in coming in contact with the ground.

With long, sloping shoulders and a long, horizontal croup go long, sloping pasterns. Long, sloping pasterns give greater speed because the power arm of the lever is shorter, as compared with the resistance arm, and give greater elasticity and therefore reduces the severity of the concussion. As before stated, draft horses are needed for speed and action, as well as for draft. Sloping shoulders and the sloping pastern also reduces the concussion and thereby increases the life of the horse upon the hard streets. It comes to pass, therefore, that draft horses are liable to be too straight in the shoulders, too straight and too short in the pastern, and too steep in the rump for the market demands, and what is a virtue from the standpoint of securing extreme power becomes a fault when considered from the standpoint of the market demands.

In this connection, it may be stated, that the upper and lower angles made by the segments of each limb, is larger in the draft horse, while the intermediate angle is smaller than in a horse for speed. This conformation gives the most advantageous insertion of muscles on the bones for force and also, on the whole, brings the horse nearer the ground, thus lowering his center of gravity. The depth of chest of a draft horse approximates the distance of the chest to the ground, although the latter distance in the average American draft horse appears to be about one inch greater than in the depth of chest, while the average of thirty-two American standard bred trotters, as measured by Messrs. Johnston and McClelland, class of 1899, Ohio State University, shows a difference between these two measurements of over six inches.

The length of neck in a horse for speed is of prime importance because it gives him great facility in the use of his head, which, when he is in motion, is used for precisely the same purpose as a tight rope walker uses his balance pole. An ideal position for both the head and neck is an angle of forty-five degrees with the horizon, which makes the angle of the head with the neck a right angle. This position of the head gives the best bearing for the bit; gives the driver the best control of the horse; places the eyes in a position to see the road at the most advantageous distance, and gives free passage of air through the trachea. In a horse for extreme speed, where the track is smooth, the head may be held in a more horizontal position, because it raises the center of gravity and throws it forward, thus making the equilibrium more unstable and thereby, as heretofore explained, increasing the speed. For power alone, however, the length of the neck is not important, provided it is well muscled and the head may be held lower and in a more vertical position because the fact that it is a means by which the pro-

pelling power of the hind members is conveyed to the collar If the back were a rubber tube, it would collapse. No more propelling power can be exerted by the hind members than the back is capable of conveying. This stoutness of back and this power of conveying force, be it noted, should come as far as possible through the shortness, width, and thickness of loin and through the width and muscles of the back, rather than through the shortness of the back proper. That is to say, the chest, which the back proper bounds, should not be unduly shortened lest the lung and heart power be reduced. Well sprung ribs extended well back, making the distance from the point of the shoulder to the last rib long, is desirable, because this is the boundary of such vital organs.

In the draft horse, some concessions, to be sure, may be made for the purpose of increased strength. In the trotting horse, having only a bicycle sulky to pull, great heart and lung power is essential; greater speed at the trot can be obtained, also, by greater length between fore and hind feet, the city. All told, nearly two thousand measurements were taken. I have every reason to believe that the work was intelligently and carefully done. The one hundred and one horses measured were classified by the owners or stable foremen into: Extra good heavy draft horses, 55; medium good heavy draft horses, 17; extra good light draft horses, 16; medium good light draft horses, 13. The following table gives a summary of some of the more important measurements of the fifty-five considered extra good and of the seventeen considered only of medium value for heavy draft purposes, and also gives a few comparisons of average measurements of the thirty-two standard bred American trotting horses:

	Extra Good Dft H's	Medium Good Dft H's	Trotting Horses
Number of horses measured	55	17	32
Weight	1,613	1,579	
Height at withers	66	67.12	61.7
Height at croup	65.6	68	61.6
From point of shoulder to point of buttock.	67.8	68.75	62.8
From lowest point of chest to ground	33.5	34.12	34.9
Circumference of body at girth	90	87.8	70.5
Circumference of front cannon at center	9.66	9.75	
Length of head	26.66	26.8	24.6
Length of shoulder	27.25	27	23.9
From dorsal angle of scapula to hip	30.4	31	28.5
From point of hock to ground	25.5	25.9	24.0
Width of chest	20	19.5	
Width of hips	25.2	25.12	
Length of croup	22.5	22.75	

We have in this table a composite picture of the two types. Comparing these composite pictures, it is found that the extra good heavy draft horse compared with his less valuable brother, is not so high for his weight; is deeper in the chest; shorter from the chest to the ground; larger in the chest girth but slightly smaller in bone. Compared with the length of the head, the shoulder is longer, the back shorter and the hock closer to the ground; the chest and hips are slightly wider, while the length of the croup is slightly less.

Confining ourselves to the fifty-five horses considered extra good heavy draft, their weight in working condition varied from 1385 to 1930 pounds; the height varied from 15½ to 17 hands 1½ inches; the girth varied from 84 to 99½ inches, while the circumference of the cannon, midway between the knee and fetlock, varied from 8¾ to 10¾ inches. Of the 101 horses measured only two measured more than 98 inches around the girth and only five measured over 94 inches.

The composite of an extra good draft horse, as found in use on the streets of Columbus, was a horse weighing a little more than 1600 pounds, 16½ hands high, measuring 90 inches around the girth and 9¾ inches around the cannon, at its center.

Horse breeding is confessedly the most haphazard of any of our breeding operations. The circumstances under which cattle, sheep, and swine are bred, require the breeders to give the subject constant and intelligent consideration. The result is, he has a more or less clear ideal towards which he is breeding and he mates his sires and dams for the purpose in view, recognizing that "As a man soweth, so shall he reap." In a large proportion of cases, the type of horses which a farmer breeds is largely an accident. He seldom has any very clear idea of the market demands.

It seems to me that having determined, by careful investigation, the types most in demand either at home or abroad, a campaign could be begun to educate the farmer in the type desired. For example, a placard, containing an outline of the type of horse demanded by our foreign markets for heavy draft purposes, might be prepared on which were some of the measurements which such a horse should possess. Set the average breeder of horses to applying these measurements to the horses he is breeding and you would have an education in type, which would be most marked. It is, of course, freely conceded that a horse might have all of these measurements and be worthless,—quality, style, action, temperament, and soundness are, however, already recognized as matters of importance.

The important thing at present is to teach the raiser of horses that these things must be accompanied by certain conformations in order to be adapted to market demands. We will never reach our goal, unless we work towards a definite ideal.

MANAGEMENT AND FEEDING OF BREEDING SWINE

By Hon. A. J. Lovejoy, Roscoe, Illinois.

I was somewhat surprised that you sent away out to Illinois to get a man to talk about the hog. I thought you had better hog men here.

The Breeding and Selling of Pure-Bred Swine.

To some men the breeding of swine is looked upon with disfavor if not with absolute disgust, yet the hog is known over the entire world and is confined to no one part in particular.

He is the animal which the ancients sacrificed to the Goddess of the Harvest, (Ceres). He is also—as the Irishman says "the gintilman that pays the rint."

The utility of the hog is in a great measure owing to its remarkable fecundity, reproducing at the age of one year and bearing from five to ten at a time and often more. While I am a believer in prolific strains and would favor sows that produce good litters I am not a crank for extra large litters and think that litters of six to nine are better than from ten to fourteen, as I believe that the sow can raise the former number better than she can the latter that the former litter will bring more money from a breeder's standpoint than the latter. I am somewhat like the professor who began farming and stock raising and always did everything according to the book, having a book on cattle, hogs, horses, sheep, and poultry. He always consulted these books before deciding any matter regarding them. One day his man of all work came running to him in great haste saying "Prof. that old goose out in the barn has 16 goslings, what shall I do with her?" The professor immediately consulted his goose book and said: John; go right out and kill seven of those goslings as no goose can suckle more than 9. This is the reason that I do not care for extremely large litters, as I wish every pig to do his very best.

The Hog as a Source of Income.

The hog has been a reliable source of revenue on the American farm since the earliest recollection of man. In olden times every farmer kept but a few hogs while the laborer in the village, or the mechanic, or the Irishman on the section each kept his pig to consume the refuse of the kitchen and garden, and to supply his family with that choice old fashioned home made sausage, ham, and head cheese, as well as various other products, while at the present time the uptodate American hog supplies in his various products the wants of the people of the entire civilized world, not only with choice bacon and hams but with lard, lubricating oils, combs, brushes, knife handles, buttons, and ornaments of many kinds. Even the blood and bristles are all saved; the blood with scraps of meat and bones is used in the manufacture of Blood Meal, and Tankage. The Blood Meal being a good feed to combine with other feed for young calves, while the tankage is used for combining with meal or other feed for the growing of pigs. I wish here to say a few words regarding the use of this Digester Tankage as it is called. It is composed of blood, bones and meat scraps thoroughly cooked and dried then ground into a fine meal, and it contains 58% protein or bone making material and for the purpose of making growth in young pigs is even equal to or better than milk. We in the west have no milk to feed or at least we at home do not and for a number of years have used Tankage instead and with good success. In a feeding test at the Iowa State Ag'l College, several lots of pigs of same average weight were fed various kinds and combinations of feed and made the largest gains as well as the cheapest on a combination of 80% corn meal and 20% tankage. We use tankage combined with wheat middlings or with ground oats and corn meal and find it a satisfactory feed for rapid growth, as well as a good flesh former. You will note that there is no waste in the present day methods of slaughtering swine and when a hog has passed through one of our great slaughtering establishments there is nothing wasted except possibly the squeal, and I have heard it stated that even this was preserved by the phonograph

You also often hear the remark "as dirty as a pig." This is a villification of the animal that Franklin's colored servant said was "the only gentleman in England" from the fact that he was the only animal in that country that did not have to work for a living. It is a well known fact that in most respects the hog is the most cleanly of our domestic animals, and unless confined to very close quarters, will always keep himself and his bed clean. In this respect he is much more cleanly than the horse or the cow.

It has been said that "the hog is a machine that oils himself, puts ten bushels of corn in to a less space than a bushel basket, and in doing so doubles its value, then can carry it to market on his back. Corn, barley, oats, rape, clover or any of the products or by-products of the farm loaned to a well bred hog is money at big interest, in fact the hog may be called a mint. The corn, grasses, etc., the bullion, which put into the hog is transmuted into coin; it is an honest mint and gives 16 ounces avoirdupois of edible meat. Properly bred, fed, and intelligently handled this autocratic porker will pay off our debts, place a piano

in the parlor, a carriage at the door, and furnish the cash to send our boys to the agricultural college, and make better farmers and stock breeders of them.

Market Demands.

The market of the present day demands quite a different weight of hog than in former years, and yet almost any kind of a hog will bring ready money, but not all with the same profit to the grower. The most profitable hog for the general farmer to raise is the one that with good care and feed will reach a weight of 225 to 285 pounds in the shortest possible time, and at the least cost to produce. To do this he must be a pig of good length of body, well bred, a good feeding type and must make a portion of this weight on grass, rape or clover. There has been of late years a great hue and cry about the bacon pig and there are men who would have us go back to the type of the Razor-Back by trying to convince us that the Tamworth is the only hog for the farmer. He may be a good hog for some countries but in the west he is not looked upon with favor. When the markets of this country demand a bacon type of hogs they can be furnished by selecting the more rangy types from our present popular breeds and by a system of feeding they can be brought to the bacon standard, but till the markets will pay a premium for this type of hogs, the farmers—especially of the corn belt—will continue to grow the quick early maturing type of hogs that are always ready for the market from three months of age up. This type of hog furnishes good bacon and hams as well as lard and other meat products. Speaking of hams and bacon it is said that "the principal reason our hams are discriminated against in the English markets is because of their better quality and that they can be sold there cheaper than those produced in their own country."

American Pork Products Abroad.

It is a recorded fact that the highest priced pork products sold in Ireland by the Limerick dealers, was put up in Chicago, and by special instructions marked with private brands of Limerick dealers, who for years have been selling American hams and bacon on the continent as "Best Irish Hams and Bacon."

The authority for this may be found in the Consular reports Nos. 122 and 129. It is also a matter of record that the Bacon Curers' Association of Great Britain, who prosecuted the Junior Army and Navy Stores of London for selling American hams for Irish, secured a fine and costs amounting to $360. Investigation showed that the American hams were changed to Wiltshire by oiling and rubbing them with meal, then branding "Best Wiltshire" they were put on the market as genuine Irish product and brought 24 cents lb., while the remainder of the identical shipment sold for 17 cents lb., as American product. This is sufficient evidence that all the American farmer needs to do is to keep up the quality of his product and the English market is assured. It would thus seem that we do not need any special bacon type of hogs to produce the highest quality of product.

While I am an advocate of the early maturing breeds, I want a pig that will make 225 pounds at six months of age when properly fed, or 250 to 285 at eight months of age for the market, and I want him of such conformation that he can be made much heavier when pushed for the show ring. Or one that when in shape will at one year of age weigh 500 pounds. Or at maturity will weigh 800 pounds or more.

We have in our own herd even greater weights, having a boar that at 16 months weighed 740, and another that when shown in his yearling form weighed 787, and also a two-year-old that at St. Louis this year weighed 926, and could have been fed to 1100 pounds very easily, in fact we had to hold back the feeder who wanted to make him weigh more. This early maturing type that with present conformation can at maturity be made to great weights is the result of years of selection and good breeding and feeding.

So much in general regarding swine growing, now how are we to produce the best and most profitable kind of hags. This can only be done by using pure-bred sires, and still better if we use pure-bred dams as well. This brings me to the subject of my paper.

The Breeding and Selling of Pure-bred Swine.

I have no ax to grind as to what breed a man should breed, will only say that a man who wishes to commence the breeding of pure-bred hogs should select the breed that he likes best, and that is best adapted to his part of the country. We have been breeding but one breed for about 30 years. We commenced with the Berkshires and have never had any reason to change our breed. We commenced at the bottom, and almost below the bottom, and in a very small way commenced what has become our life business. It has been a somewhat slow gait, but have kept at it till we now enjoy a national reputation and trade. Not only shipping pigs and hogs to every state in the Union, but annually shipping to foreign countries.

The route has not always been strewn with roses by any means, but has been rugged and quite rough at times, and when I glance back over the 30 years I almost wonder that I never gave up. I was looked upon as one who was "batty" for paying what I did for my first pair of pigs, and was the cause of many slurring remarks in my early days for trying to raise better pigs than the scrubs of our neighborhood, yet this had no effect on me or my purpose and I simply grew in the business as I grew in knowledge regarding it. I well remember how I first made my appearance in the show ring. It was at the Illinois State Fair, where I first went to conquer, but like many others I met the enemy, and was his. It was there that I first met your worthy President, Mr. W. C. Norton, and will never forget how my heart sank as the judges passed my pens only to glance and then go on and place all the blue ribbons on the Norton herd. While I then saw all my hopes go a glimmering, I did not give up nor did I abuse the judges or the Fair Association, but made up my mind to come again another year, and to come a little stronger, and in this way as the years came and went, I began to see that there was something in the future, and as I began to generally get inside the money in the prize list I was encouraged to still further efforts till after a few years we began to get at least our share of the blue ribbons at the leading shows, and thus for some 15 years we followed the great shows and finally at the World's Fair at Chicago in 1893, we met and defeated both England and Canada, as well as America, by winning the championship herd prize for the best herd of Berkshires over one year old. This gave us such a boom that we have never been able to fill our orders since, and have never made a general show since, and have made but two single entries at any shows since. We sell many show hogs and pigs each season which go into the hands of prominent breeders throughout the country, and we like this better than to follow the show ring ourselves.

You may say that all this hard work and time is too much to give to the breeding of hogs, but how can any business be built up without hard work and lots of it? Any one that is really interested in the work can do fully as well if he will enter the business with a determination to stick to it.

How We Handle Our Hogs.

Many breeders use a building called a hog house, where the whole herd is kept. Our method is very different and we prefer the individual house with plenty of yard room, so we took a field of clover of 20 acres and fenced a narrow lane through the center, and then divided the ten acres on either side into lots of an acre each, and put a little house 8x8 square in each lot. All fences are of woven wire 30 inches high and each lot is an acre, and each lot contains a sow and her litter, thus giving her plenty of room for the much needed exercise, and all the grass she and her litter can use, and more, too. These houses are all neatly made and set in rows and are all painted alike and the field looks like a little city. Houses are all numbered. Houses are built double boarded with four-inch air space between walls, and well ventilated, and are plenty warm in winter and cool in summer.

The sow and litter are fed here till pigs are three months old, when the sow is then removed and the pigs remain till shipped out on orders. By keeping but few together in this manner we can make a better growth than when 50 to 100 are fed together, and there will be no runts among them. When the pigs are old enough to need separating we assort them and place all boars by themselves on one side of this lane, and all sows on the other. All pigs not good enough for shipping to breeders are fed for the market.

We feed with a horse and a low wagon only one foot in height, and feed is dipped out from the barrels with a long handled dipper, and it is really but little work to feed one or two hundred pigs in this manner, being easier than carrying a pail of feed in a hog house. We are satisfied that we get better results in this manner than if we kept 100 to 200 hogs and pigs in one house, besides giving them all the advantage of grass and exercise. We feed everything quite liberally, and when the young pigs are about three weeks of age and begin to show signs of wanting to eat with their mother, we have a platform 16x16 in the corner of each lot where the litter may go and eat by themselves unmolested by the sow, and in this way we help to push them along till weaned, when they are well on feed and growing rapidly, and never have any setback when the sow is taken away. We often have letters asking the price of pigs 6 to 8 weeks of age. We always answer that we do not price any pigs so young, for the reason that a pig taken from its mother at 6 to 8 weeks and shipped to a distant state will certainly get a set-back or check in growth, and growth is what we all want and as much of it as possible by not sacrificing quality, and to get this we must have no check while young. There are many things to be considered in establishing a herd of pure bred hogs. First, one must have a taste for the business, and next he must have a discriminating judgment, in selecting his breeders, and then he must make up his mind to give close attention to all details. Start with as good individuals as he can afford to buy, and as well bred as can be. Besides all this he must be a good feeder, and always have in mind that there is nothing too good for his pigs. He should note carefully each day, and each time he feeds whether every pig is coming to his feed with a relish or whether only mincing a little and feed only what will be eaten with a relish and eaten clean. Never let a pig be fed so that there will be feed left in his trough after he is done. The feeder should also note the condition of every animal and keep a watch out for lice, or other little troubles, and if he finds that his pigs are lousy he must commence at once and in earnest to rid them of the vermin, or he will soon have a very unthrifty lot of pigs. Some make a practice of sprinkling their pigs with different remedies for this trouble, but one cannot do the work thoroughly enough by sprinkling, and should instead dip them, so that every part of the body will get the benefit. For this use we use a regular dipping tank, about six feet deep and much longer, and set it in the ground so that the top is only a few inches above the level of the ground, and build an incline in which the pigs are driven up till just at the end of the tank, where they slide down and are entirely covered with the dip and have to swim out at opposite end. This dipping should be done if the herd is troubled with lice as often as once a week for three or four weeks, and after this an occasional dipping will keep them free from the pest. We use a dip made for the purpose by the Moore Chemical Company, of Kansas City, Mo., and find it the best thing we have tried. Zenoleum is also a good remedy. Crude petroleum is also a sure remedy if it can be purchased reasonable. A kerosine emulsion is also very good. The dipping of the whole herd will pay well if for no other reason than that it makes them thrive and keeps hair and skin in fine condition. There are many little pig troubles that can easily be overcome if attended to in time. Many times you will hear the pigs coughing, this is often caused by the little thread worms in the throat and also by the stomach worms, either of which may be easily removed. We use for this purpose the same Moore's Hog

remedy or crude dip and put about a pint to a barrel of slop feed, and if this is used twice a week you will hear no more of the cough, and then continue once weekly you will never hear any more. We have not heard a pig cough on the farm for several years.

A matter of considerable importance where pigs are fed heavily is the benefit derived from feeding charcoal. In our country where corn is plenty we burn all cobs, and for this purpose we built a pit about as you would build a cistern and walled it up with stone, and by starting a fire at the bottom and filling in with cobs as they come to a red glow and continue this till the pit is full, then pouring over the whole a barrel of water with salt added and covering the pit tightly with the sheet iron cover to keep out the air, the whole will form as good a quality of charcoal as can be, and one would be surprised to see the animals leave any kind of feed and heartily eat this charcoal. We burn all the cobs from the corn raised each year, and you will never find any lying about the feed yards, in fact, we seldom feed whole corn anyway, but grind all and mix with other feeds.

In breeding pure bred hogs there is another matter that should be attended to and that is the marking of the different litters, so that no mistake can possibly be made in identifying each pig.

We have tried all kinds of ear labels, but as yet have found none that are satisfactory, and years ago commenced the system of marking with a harness punch by making a little half-round hole in rim of the ear. We can in this way mark them so that a hundred or two may be marked and without disfiguring the ear if properly done.

When a pig is ordered he is selected and his ear mark taken and entered on our book of blank pedigrees, and it is then easy to turn to his dam and see what his sire was and all about him and his pedigree can be made and made correctly. Careful attention in the matter of keeping correct records of all breeding ages and number in litter, that no error can be made will have much to do in the future success of the business. All letters received should be answered promptly and a carbon copy of each should always be made and filed with every letter received, that one may know what he has written. This alone is a very important matter, and will save many misunderstandings. Many men who write for a pig do not do this, and after a week would not know what they had written. We have filed where we can get it in ten minutes every letter received in twenty years, as well as the answer to it, and we never have any misunderstanding with any one over what he ordered.

Selection of the Brood Sow.

When you go out in the lot to select a few more sows from your herd to use for breeders, do not always select the plumpest, fattest one that looks so nice, she will not make as good a mother or breeder as one that is a little longer in body or a little more motherly in her appearance. In fact, I would not select them till nearly or quite a year old. In our own experience we have bred very few young sow pigs and usually keep them till near a year old before breeding, believing that the selection of too young a sow and breeding to a young boar will not produce as good litters or as good pigs as when from mature or nearly mature animals. This I believe is one of the reasons of the general fineness and extremely small litters that are found in many of our herds to-day. It is not in accordance with nature. Many of the large growers of hogs in the corn belt of Illinois have made a practice for years of selling the brood sows each fall and selecting from the spring pigs a large number of young sows from six to seven months old, and then breeding to a boar of about the same age till they have reduced both the size of their animals as well as the size of the litters, and also the stamina of their hogs, and today are getting litters of two and three pigs instead of litters of five to ten good strong ones. In our own herd when we find a sow that is a good mother and raises a fairly good sized litter and takes good care of them, we keep her as long as she lives, unless some appreciative customer comes along and offers a tempting price.

We had a customer last month that came over a thousand miles to buy brood sows of us, and took three at from $200 to $250 each that were well along in years. Of course these sows were bred to a most remarkable boar, for which we paid $1,000 in cash, and is conceded by nearly every prominent breeder to be without an equal in the breed, and sows bred to him are in great demand from all parts of the country.

After the brood sows are selected and bred they should be fed with a view to the future good of the litter, and should have a ration that will produce bone, flesh and frame instead of fat alone, and for this a combination of feeds should be used, which contain the proper nutriments, such as wheat middlings, or what is known as ship stuff, or ground oats with cornmeal with a little bran, but under no consideration feed corn and corn alone, or your sow will, when she comes to farrow, bring a litter of weakly, squealing, puny things that will not have vitality enough to get to their dinner; and the sow herself will be feverish and likely eat every pig as it comes near her. Sows should, during the winter, have something to take the place of grass, and with us we can find nothing better than well cured clover hay or alfalfa, run through a power cutter and mixed with the feed or even fed separate. We also use some sorghum, which is relished by the hogs, and it is astonishing how much of these rough feeds a herd of 100 or more hogs will consume.

We used to grow sugar beets for this purpose, and they are a grand feed, but the farmer of the west will not get down on his knees and weed beets for hogs, or even for a sugar factory, and we have given it up.

Selecting a Boar for the Herd.

It is said that the boar, bull or stallion is half in the matter of heading a herd or stud, and this is fully true, so when you wish a boar get as good a one as your purse will allow, and you will be well repaid. Good boars are eagerly sought for by all leading

breeders, so do not expect a world-beater for nothing. We have had letters asking for a pig that would score 100 points, and then some, and winding up with the words, "Remember, that I do not pay any fancy prices and will not give over $20 for such a pig as I have described." We generally answer this kind of a letter by saying that such a pig has yet never been bred, and when we get one we will use him ourselves. There are many choice boars that can be purchased reasonably, but real outstanding show boars or sows either, command good strong prices. We made a public sale of 47 head of Berkshires, varying in age from five monts pigs to yearlings, that made an average under the hammer of $107.76 each, and all were purchased by parties attending the sale, so that something like a hundred mail bids did not get an animal. I mention this simply to show that real breeders know the value of an animal when they see it, and it has been our experience that the best ones are the easiest to sell even at strong prices. We find in shipping pigs and hogs to the various States that the farther East we go the lower prices are expected; why this is, I cannot say. The South and West—especially the far west—will pay the longest prices for something that suits them. The demand for good Berkshires was never greater than now or during the past few years, and each year finds us sold out long before the orders quit coming, either for young pigs or for mature animals. One need never fear an over production, but rest assured of a market for all that are good enough to ship.

In the breeding and selling of pure bred swine, one must always do business on the square, for he cannot long do business any other way. It takes time and careful dealing to build up a good business, and when established he must continue the same painstaking methods or he will soon find his business leaving him, and when once it starts to other channels how very fast it goes, and he is soon without any. One should always make it a point to satisfy a customer if any complaint is made, for a satisfied customer always comes back and a dissatisfied one seldom or never.

The Dark Side of the Business.

That there is a dark side to any business all must admit, and the breeding of pure bred swine is no exception.

One may have given his herd all the proper attention possible, had all sanitary conditions perfect, all feed just right, all little attentions given and some fine morning he will find here and there a pig that is "off his feed" and has that tired look and appearance, and showing symptoms of that dread disease known as cholera, or swine plague. We can all detect it at a glance, and it generally gives the owner symptoms of heart failure, too, unless he has a heart of steel, to see his whole year's crop drooping. He may try every one of the sure cures, and he will lose most of his herd just the same, as when the germ once gets into a herd they are a goner, or at least a large per cent. of them. After 30 years of experience I have made up my mind that I know as little regarding this disease as when I commenced and have tried all the sure cures without any success. We have found the very best thing to do when disease breaks out is to separate the well ones and remove them to fresh pasture where they cannot come in contact with any that are ailing, and take off the feed. The less sick or exposed pigs are fed the better. We have had three outbreaks during our years of breeding, and the last time we had trouble we had heard so much regarding Dr. De Vaux and his Anti-Toxin that we at once wired him on the very first signs of trouble to send a Vet, and Anti-Toxin enough for our herd, and he did so. When the Vet arrived he looked over the entire herd and said to us that there was no cause for alarm, as but seven showed any symptoms, and these were far from the rest of the herd. We said go ahead, and turned him loose with a good man to help him, and he commenced by innoculating the well ones each day for five days, assuring us all the time that this would certainly immunize them. Well, on the fifth day they all commenced to die and died like flies before a freeze, and the Vet. remained till 151 of them had died and then he had business somewhere else. The balance that were not immune from former outbreaks also died along during the winter. A few always pull through and these are worth their weight in gold, as they will never take it a second time. We have learned some things regarding this trouble, and one is that a sow that is carrying a litter when the disease breaks out, if she lives through and does not lose her litter, it will surely be immune from future attacks. We try and make it a point to keep all sows that pull through, as well as what breeding boars we have. In this way one is never entirely wiped out of business. I have a friend who was prevailed upon to purchase some sure cure, and finally did so, but it was to be shipped to him at a station that was eight miles from the farm. After a time the agent called upon my friend again and wanted a testimonial regarding his cure, and my friend said he was ready to give him one, and did so, saying, "I have not had any disease in my herd since purchasing your remedy, as it is at the station where it was shipped eight miles from the farm."

I will bring my paper to a close by saying that there is something about the breeding of pure bred hogs that to me is very interesting. The study of making certain matings and noting the results, is decidedly interesting. Animals are like clay in the hand of a moulder, if one likes the study he can almost mold the living form of animals to his notion if he keeps at it, and in a series of years he can have a herd of hogs that that will be a model, if he has the right model in his mind at the start. The breeding of swine, whether for the market or for breeding purposes, if earnestly followed for a series of years, will prove the most profitable for the amount invested that one can go into. The old saying that for big money breed horses, for sure money breed cattle, and for quick money hogs is still true and in my opinion the breeding of hogs comes near combining all three.

DISCUSSION.

Q. What kind of grass?
A. Clover when we started. Now only bluegrass.
Q. How do you water your hogs?
A. Water from a well at noon each day with this same wagon. No running water. I am a little afraid of water coming from other farms; disease germs get in the water.
Q. What protection do you give your hogs during the winter?
A. We use these same houses; they are built double, lined with building paper between. The north door is shut; the south door is left open during the day. After they have all gone in at night we step out and close the doors if it is cold.
Q. Do you put several in those houses?
A. Sow and litter or three, five or eight pigs, according to the size of pigs.
Q. What is the size of the house?
A. Eight feet square.
Q. What kind of boards?
A. Flooring, matched.
Q. Are they on the floor or on the ground?
A. On the floor, bedded with nice dry rye straw, swept twice a week and rebedded.
Q. Are they comfortable?
A. Yes, very. I set them in rows of ten each in the field just as straight rows as a row of corn would be. There is a little woven wire fence in between. That keeps them separated in one-acre lots.
Q. Do you have two litters a year?
A. Sometimes if sows farrow early. In our business we have to have pigs coming nearly every month of the year for the reason that we have calls for all ages. If I were growing for the market I would try to have the pigs come in March and August.
We had a litter farrow on the 22d of December with the thermometer 22 below zero; we hung a lantern in the pen and it was just as warm as a bed-room.
Q. What is the height of the house?
A. We have twelve feet slope come up together at the top with the exception of about two inches for ventilation. This opening covered with inverted V-shape trough over opening.
Q. What do you do about the spread of the cholera?
A. I don't know that your state has done anything to provide any means for the protection of hog growers. There is no doubt you have thought of this matter. We use all the means we possibly can to prevent the spread of it, yet at the same time the germs are carried into our herds in such a way that they get it.
Q. Have you thought of any way to protect?
A. Our state has done nothing. I know of no way to surely prevent the spread of this disease. About the best we can do is to use disinfectants and keep everything very clean and sprinkle lime everywhere about the yards, sleeping places and troughs, and keep strangers from coming about the hogs unless assured they have been near no infected herds. We allow no hog buyers that travel the neighborhood buying hogs for the market to drive onto the farm when sickness is anywhere in the vicinity. I know that the germs can be carried, either by crows, dogs or chickens from one farm or lot to another. I know of instances where hogs were sick on one side of a woven wire fence and those on the other side never took the disease. But if one had stepped over the fence from the sick yard to the other, the others would have had the disease.
Q. Do you have window lights in your hog pens?
A. Yes, four lights, eight by twelve. The windows are hinged so they will swing in.
Q. Do you try to get milk for the pigs?
A. No, sir, we have no milk. The milk of human kindness is the best kind we have.
Q. How much tankage do you use?
A. We feed it with middlings and corn meal, about three-fourths or two-thirds meal and ten per cent. tankage; as the pigs get larger and become where you want to put some flesh on instead of growth, take off the middlings and make eighty per cent. corn meal and 20 per cent. tankage.
Q. What do you pay for tankage?
A. $30 for 58 per cent. protein tankage.
Q. Do you have sows eat their pigs?
A. Never. Feeding corn alone while she carries her litter is what causes it. Throw out all the corn the four months while she is carrying the litter, and by the time they are born she will eat anything.
Q. Do you feed them any salt?
A. Put salt in their feed.
Q. How about charcoal?
A. Feed once a week. Dissolve copperas in the water.
Q. What do you feed your brood sows?
A. Fed them this winter ground corn and oats equal parts, little tankage, alfalfa hay run through the cutter until it is fine.
Q. How many times do you feed a day?
A. Twice; never feed three times a day.
Q. Is there any danger of disease where you get the tankage from the slaughter house?
A. I don't think there is. It is so thoroughly prepared by the boiling process, and under pressure, and then under high temperature, three or four hundred degrees heat, and the skimming takes off a great deal of the impurities.

WHAT WE BREED

Pure Bred Stock Bred by Members of the Pennsylvania Live Stock Breeders' Association

HORSES.

THOROUGHBREDS.

Name.	Postoffice.	County.
R. S. Hartley	Youngsville	Warren

STANDARD-BREDS.

B. W. McKeehan	Mt. Rock	Cumberland
W. A. McCoy & Sons	Mercer	Mercer
H. C. & M. R. Elder	Darlington	Beaver
Henry Palmer	Avondale	Chester
Powell Bros.	Shadeland	Crawford
W. H. Ridge	Trevose	Bucks
John B. Kepple	Greensburg	Westmoreland
Ridge Farm (W.C.Norton)	Aldenville	Wayne
W. E. Stevenson	Burgettstown	Washington
Jas. H. Cowan	Duquesne	Allegheny

TROTTING-BRED.

J. M. Main & Sons	Shippensburg	Cumberl'd

FRENCH COACH.

Julius LeMoyne	Washington	Washington
Geo. Erk	Seelyville	Wayne
Powell Bros.	Shadeland	Crawford

HACKNEYS.

Powell Bros.	Shadeland	Crawford

CLYDESDALES.

H. C. & M. R. Elder	Darlington	Beaver
Powell Bros.	Shadeland	Crawford

PERCHERONS.

Nelson Poorbaugh	Mt. Pleasant	Westm'd
E. B. Boyle	Canonsburg	Washington
W. A. McCoy & Sons	Mercer	Mercer
Powell Bros.	Shadeland	Crawford
Geo. A. Hogg	Pittsburg	Allegheny
J. M. Main & Sons	Shippensburg	Cumberl'd

ENGLISH SHIRES.

Sam'l McCreary	Volant	Lawrence
Powell Bros.	Shadeland	Crawford
W. L. Christley	Slippery Rock	Butler
Geo. A. Hogg	Pittsburg	Allegheny

MORGANS.

M. B. Stephens	Dilltown	Indiana
A. R. Van Tassel	Dubois	Clearfield

CLEVELAND BAYS.

Powell Bros. ....Shadeland.....Crawford

SHETLAND PONIES.

Wm. F. Gable....Altoona.....Blair
Powell Bros. ....Shadeland.....Crawford
W. M. Thompson..Uniontown.....Fayette

CATTLE.

SHORTHORNS.

Name.	Postoffice.	County.
W. C. Black	Mercer	Mercer
John Cummins	Cummins	Greene
W. A. McCoy & Sons.	Mercer	Mercer
R. L. Munce.	Canonsburg	Washington
W. J. Monroe	Greensburg.	Westmoreland
B. L. Post's Sons.	Claysville	Washington
Pa. State College.	State College	Center
A. G. Shaffer.	Rural Valley	Armstrong
T. M. Shively.	Mifflinburg	Union
Geo. G. Strosnider.	Cummins	Greene
W. M. Thompson.	Uniontown	Fayette
J. R. Truxal.	Greensburg	Westmoreland
A. S. Worden	Ulysses	Potter
L. D. May	Granville Center	Bradford
L. Douthett	Thornhill	Allegheny
J. L. Stouffer	Southwest	Westmoreland
A. S. Eagleson.	Washington	Washington
F. N. Hubbard	Troy	Bradford
C. A. Hershey	Gettysburg	Adams
Lee R. Scott.	Burgettstown	Wash.
R. C. Vance.	Burgettstown	Wash.

POLLED DURHAMS.

Chas. Buchanan ..Utica.....Venango
J. C. Mattern & Sons..Hollidaysburg....Blair
D. C. Andrews..West Newton.Westmoreland
Lee R. Scott.....Burgettstown.....Wash.

RED POLLS.

D. Norman App..Selin's Grove.....Snyder
B. E. Ferris.....Hector.....Potter
N. O. Brownlee..Claysville.....Washington
R. W. Crothers & Son.Taylorstown....Wash.
T. M. Shively...Mifflinburg.....Union

ABERDEEN-ANGUS.

W. H. Rink....Johnstown.....Cambria
Geo. Black.....Plumville.....Indiana
Bayard Bros. ..Waynesburg.....Greene
James Blair ....Hartstown.....Crawford
Pa. State College..State College.....Center
W. L. Christley..Slippery Rock.....Butler

DEVONS.

J. Cheston Morris..West Chester....Chester
Powell Bros. ....Shadeland.....Crawford
A. S. Worden....Ulysses.....Potter

HOLSTEINS.

A. S. Worden.....Ulysses.....Potter
W. T. Suter....Riverside..Northumberland
Sam'l McCreary ..Volant.....Lawrence
J. L. Henderson & Son..Washington..Wash.
H. M. Lyon & Son..Wyalusing.....Bradford
J. M. Quivey....Houston.....Washington
Powell Bros. ....Shadeland.....Crawford
W. E. Stevenson..Burgettstown.....Wash.
W. M. Benninger..Benningers..Northampton
Jas. M. Paxton..Houston.....Washington

JERSEYS.

R. S. Hartley....Youngsville.....Warren
Jas. I. Thompson.Lemont.....Center
Chas. A. Porter.Torresdale.....Philadelphia
Ludwig S. Filbert.Fox Chase....Philadelphia
C. M. Glasgow.....Calvin.....Huntington
Geo. S. Barnhart..Greensburg.Westmoreland
E. B. Boyle...Canonsburg.....Washington
Austin Leonard & Son..Troy.....Bradford
R. I. Young....Middletown.....Dauphin
Geo. Erk .....Seelyville.....Wayne
H. C. & M. R. Elder.Darlington.....Beaver
Wm. W. Harrison..Glenside....Philadelphia
W. F. Holtzer..Greensburg.....Westmoreland
J. F. Lantz & Co..Glenmoore.....Chester
L. W. Lighty....East Berlin.....Adams
B. W. McKeehan..Mt. Rock.....Cumberland
A. L. Martin....Harrisburg.....Dauphin
S. E. Nivin.....Landenburg.....Chester
Perham Bros. ....Niagara.....Wayne

Powell Bros. ....Shadeland.....Crawford
Ridge Farm.....Aldenville.....Wayne
R. F. Shannon..Edgeworth Sta....Allegheny
W. F. Shrum...Adamsburg....Westmoreland
M. P. Shoemaker & Bro.,Greensburg.Westm'd
Edward Walter..West Chester.....Chester
A. P. Warren.....Elizabeth.....Allegheny
J. B. Wylie....Washington.....Washington
John B. Kepple..Greensburg...Westmoreland
Jas. H. Cowan..Duquesne.....Allegheny
J. M. Main & Sons..Shippensburg..Cumberl'd

GUERNSEYS.

J. N. Glover....Vicksburg.....Union
R. S. Hartley..Youngsville.....Warren
H. C. Bughman..Greensburg..Westmoreland
T. M. McKee....Lewistown.....Mifflin
H. W. Comfort..Fallsington.....Bucks
Wm. F. Gable....Altoona.....Blair
Henry Palmer ..Avondale.....Chester
Pa. State College State College.....Center
N. Poorbaugh..Mt. Pleasant....Westmoreland
W. H. Ridge.....Trevose.....Bucks
J. E. Woodmansee..Lake Como.....Wayne
H. H. Snavely....Lancaster.....Lancaster
I. F. McKee (R.D.No.5), Washington, Wash.
J. H. Peachey....Belleville.....Mifflin

AYRSHIRES.

Thos. Turnbull, Jr..Allegheny.....Allegheny

HEREFORDS.

J. I. Barley....Baker's Summit.....Bedford

POLLED ALBIONS.

B. E. Ferris.....Hector.....Potter

BROWN SWISS.

R. I. Young.....Middletown.....Dauphin
W. H. H. Riddle..Butler.....Butler

SWINE.

POLAND-CHINAS.

Name.	Postoffice.	County.
J. C. Mattern & Sons.	Hollidaysburg	Blair
C. A. Hershey.	Gettysburg	Adams
D. Norman App.	Selinsgrove	Snyder
J. I. Barley	Baker's Summit	Bedford
H. C. Bughman.	Greensburg.	Westmoreland
Burns & Adams.	Imperial	Allegheny
H. C. & M. R. Elder.	Darlington	Beaver
Henry Palmer	Avondale	Chester
B. L. Post's Sons.	Claysville	Washington
T. M. Shively	Mifflinburg	Union
A. G. Shaffer.	Rural Valley	Armstrong
A. P. Warren	Elizabeth	Allegheny
J. B. Wylie	Washington	Washington
T. M. McKee	Lewistown	Mifflin
J. L. Stouffer	Southwest	Westmoreland
J. H. Peachey	Belleville	Mifflin
Edward Walter.	Westchester	Chester

TAMWORTHS.

R. S. Hartley..Youngsville.....Warren
Henry Palmer....Avondale.....Chester
Ridge Farm.....Aldenville.....Wayne
M. P. Shoemaker & Bro., Greensburg,Westm'd

CHESTER WHITES.

Austin Leonard & Son..Troy.....Bradford
J. A. Herr.....Mill Hall.....Clinton
Henry H. Randt.Pipersville.....Bucks
G. S. Barnhart..Greensburg.....Westm'd
E. B. Boyle....Canonsburg.....Washington
H. C. Bughman..Greensburg..Westmoreland
J. Grier Dain.....Malvern.....Chester
Jos. T. Fleming...Belleville.....Mifflin
Wm. F. Gable.....Altoona.....Blair
H. M. Lyon & Sons..Wyalusing.....Bradford
J. F. Lantz & Co..Glenmoore.....Chester
W. A. McCoy & Sons..Mercer.....Mercer
B. W. McKeehan..Mt. Rock.....Cumberland
J. C. Mattern & Sons..Hollidaysburg....Blair
W. J. Monroe...Greensburg....Westmoreland
R. L. Munce....Canonsburg.....Washington
Edward Walter ..West Chester.....Chester

A. P. Warren....Elizabeth.....Allegheny
J. E. Woodmansee,.Lake Como.....Wayne
M. P. Shoemaker & Bro.,Greensburg,Westm'd
J. R. Truxal....Greensburg....Westmoreland
L. Douthett ....Thornhill.....Allegheny
John B. Kepple..Greensburg.....West'md
A. T. Replogle....Waterside.....Bedford

BERKSHIRES.

J. N. Glover....Vicksburg.....Union
H. C. Bughman.Greensburg...Westmoreland
Sam'l McCreary..Volant.....Lawrence
George Black ....Plumville.....Indiana
W. C. Black .....Mercer.....Mercer
J. L. Henderson & Son..Washington...Wash.
W. F. Holtzer..Greensburg.....Westm'd
L. W. Lighty.....East Berlin.....Adams
S. V. McDowell & Sons..Fredonia....Mercer
Pa. State College..State College.....Center
N. Poorbaugh....Mt. Pleasant.....Westm'd
Ridge Farm ....Aldenville.....Wayne
W. H. Rink.....Johnstown.....Cambria
R. F. Shannon..Edgeworth Sta....Allegheny
Thos. Turnbull, Jr..Allegheny.....Allegheny
A. S. Worden.....Ulysses.....Potter
N. O. Brownlee..Claysville.....Washington
R. W. Crothers & Son.Taylorstown....Wash.
J. Cheston Morris..West Chester.....Chester
Geo. W. Mellotte...Lisbon.....Ohio
A. K. Miller.....Mercer.....Mercer
A. S. Eagleson..Washington.....Washington
Edward Walter...Westchester.....Chester
J. M. Main & Sons..Shippensburg..Cumberl'd

DUROC-JERSEYS.

George Black....Plumville.....Indiana
W. M. Benninger..Benningers....North'mt'n
B. L. Post's Sons..Claysville.....Washington
S. S. Blyholder....Neale.....Armstrong

YORKSHIRES.

R. F. Shannon..Edgeworth Sta....Allegheny

ESSEX.

H. C. & M. R. Elder..Darlington.....Beaver

SHEEP.

DORSETS.

Name.	Postoffice.	County.
J. L. Henderson & Son.	Washington.	Wash.
Henry Palmer.	Avondale.	Chester
J. B. Wylie.	Washington.	Washington
T. M. McKee.	Lewistown.	Mifflin
A. S. Eagleson.	Washington.	Washington

SHROPSHIRES.

J. C. Mattern & Sons.Hollidaysburg....Blair
C. M. Glasgow....Calvin.....Huntingdon
C. A. Hershey..Gettysburg.....Adams
Jos. T. Fleming.Belleville.....Mifflin
J. I. Barley....Baker's Summit.....Bedford
W. C. Black.....Mercer.....Mercer
H. C. & M. R. Elder.Darlington.....Beaver
W. F. Gable.....Altoona.....Blair
J. F. Lantz & Co..Glenmoore.....Chester
S. Shaffer.....Princeton.....Lawrence
B. L. Post's Sons..Claysville.....Washington
A. T. Replogle....Waterside.....Bedford
Edward Walter..Westchester.....Chester
D. S. Kloss.....Tyrone.....Blair

LEICESTERS.

W. A. McCoy & Sons..Mercer.....Mercer

LINCOLNS.

T. M. Shively..Mifflinburg.....Union
Edward Walter..West Chester.....Chester
B. W. McKeehan..Mt. Rock.....Cumberland

SOUTHDOWNS.

Ludwig S. Filbert..Fox Chase...Philadelphia
J. Grier Dain....Malvern.....Chester
W. A. McCoy & Sons..Mercer.....Mercer
R. W. Crothers & Son..Taylorstown....Wash
W. M. Benninger..Benningers...Northampton
Edward Walter..Westchester.....Chester

SPANISH MERINOS.

Jas. Lindsey & Sons..Utica.....Venango

BLACKTOP SPANISH MERINOS.

John M. Berry....Wylandville...Washington
Wm. Berry.....Washington.....Washington
R. P. Berry.....Washington....Washington
R. L. Munce....Canonsburg.....Washington
R. W. Crothers & Son..Taylorstown....Wash.

DELAINE MERINOS.

E. B. Boyle....Canonsburg.....Washington
Lee R. Scott....Burgettstown....Washington

NATIONAL DELAINES.

J. B. Wylie.....Washington....Washington
R. W. Crothers & Son.Taylorstown.....Wash

OXFORDS.

A. G. Shaffer....Rural Valley.....Armstrong
A. S. Worden.....Ulysses.....Potter

HAMPSHIRES.

Jas. Blair.....Hartstown.....Crawford
W. J. Monroe....Greensburg.....Westm'd
Edward Walter..Westchester.....Chester

COTSWOLDS.

S. V. McDowell & Sons..Fredonia.....Mercer

ANGORA GOATS.

W. F. Gable.....Altoona.....Blair

POULTRY.

PLYMOUTH ROCKS.

Name.	Postoffice.	County.
Austin Leonard & Son (B).	Troy.	Bradford
W. J. Monroe.	Greensburg.	Westmoreland
W. T. Suter (W).	Riverside.	Northumberland
J. A. Herr (B).	Mill Hall.	Clinton
C. A. Hershey (B).	Gettysburg.	Adams
J. H. Peachey.	Belleville.	Mifflin
M. N. Clark (B).	Claridge.	Westmoreland
Edward Walter.	West Chester.	Chester
N. O. Brownlee (B).	Claysville.	Wash
H. C. Bughman (W).	Greensburg.	Westm'd
Burns & Adams.	Imperial.	Allegheny
J. Grier Dain (B).	Malvern.	Chester
H. C. & M. R. Elder (B).	Darlington.	Beaver
J. Wolf Evans (Buff).	Spring Mills.	Center
W. F. Gable (B &W).	Altoona.	Blair
H. M. Lyon & Sons (B&W).	Wyalusing.	Bradf'd
J. F. Lantz & Co.	Glenmoore.	Chester
L. W. Lighty (B)	East Berlin.	Adams
W. A. McCoy & Sons (W).	Mercer.	Mercer
W. J. Monroe (B).	Greensburg.	Westm'd
Pa. State College.	State College.	Center
N. Poorbaugh (B&W),	Mt. Pleasant,	Westm'd
Ridge Farm (W.).	Aldenville.	Wayne
R. F. Shannon (B)	Edgeworth Sta.	Allegheny
M. P. Shoemaker&Bro. (W)	Greensb'g	Westm
J. R. Truxal.	Greensburg.	Westm'd
A. P. Warren (B & Buff)	Elizabeth,	Allegheny
T. M. McKee (B).	Lewistown.	Mifflin
D. N. App (B&W),	Selinsgrove.	Snyder
Jos. T. Fleming.	Belleville.	Mifflin
J. L. Stouffer.	Southwest.	Westm'd
J. H. Peachey (B).	Belleville.	Mifflin
A. T. Replogle (B.).	Waterside.	Bedford
Jas. H. Cowan.	Duquesne.	Allegheny
A. S. Eagleson (B).	Washington.	Wash.
W. H. Gray (Buff).	Brookville.	Jefferson

LEGHORNS.

R. S. Harley.(Bf & R C B).	Youngsv'le,	Warren
B. L. Post's Sons (Br).	Claysville.	Wash.
Jas. Lindsey & Sons (R C B).	Utica.	Venango
W. T. Suter (R C W).	Riverside.	Northumbld
Edward Walter.	West Chester.	Chester
G. S. Barnhart (Buff).	Greensburg.	Westm'd
H. C. Bughman (Br.),	Greensburg.	Westm'd
H. C.&M.R.Elder (B&W),	Darlington,	Beaver
J. Wolf Evans (Scw W&B)	Spring Mills,	Cen'r
Wm. F. Gable (W.).	Altoona.	Blair
R. L. Munce (Br).	Canonsburg.	Wash
Pa. State College (Scw)	State College.	Center
R. F. Shannon (B&W)	Edgeworth Sta.	All'y
Geo. G. Strosnider (Br).	Cummins.	Greene
M. P. Shoemaker & Bro. (Br),	Gr'nsb'g,	W'm'd
J. E. Woodmansee (Scw)	Lake Como.	Wayne
A. P. Warren (Buff),	Elizabeth.	Allegheny
N. Poorbaugh (Scw)	Mt. Pleasant,	Westm'd
J. B. Kepple (Br).	Greensburg.	Westm'd
W. H Gray (Scw).	Brookville.	Jefferson
A. S. Eagleson (Wh.).	Washington.	Wash
J.M.Main&Sons (SCW).	Shippensburg,	Cumbld

BANTAMS.

H. C. Bughman...Greensburg..Westmoreland
W. A. McCoy (WhG)..Mercer.....Mercer
R. F. Shannon (BBRGame), Edgeworth Sta. .....Allegheny

BRAHMAS.

C. M. Glasgow (Lt)..Calvin.....Huntingdon
Edward Walter..West Chester.....Chester
B. E. Ferris (Lt)..Hector.....Potter
Wm. F. Gable (Lt)..Altoona.....Blair
Pa. State College (Lt)..State College..Center
R. F. Shannon (Dark) Edgeworth Sta..All'y

COCHINS.

J. N. Glover (B).Vicksburg.....Union
W. F. Gable (Buff)..Altoona.....Blair
J. M. Berry (W), Wylandville.....Wash
Pa. State College (Lt).State College..Center
R. F. Shannon (Lt&Dk).Edgeworth Sta.All'y

MINORCAS.

R. S. Hartley (R C Bl)..Youngsville, Warren
Wm. F. Gable....Altoona.....Blair
Pa. State College (Blk) State College..Center
Thos. Turnbull, Jr..Allegheny.....Allegheny

POLISH.

Pa. State College..State College.....Center

RHODE ISLAND REDS.

R. F. Shannon.Edgeworth Sta.....Allegheny
Pa. State College..State College.....Center

WHITE WONDERS.

T. M. Shively..Mifflinburg.....Union

GAMES.

Pa. State College..State College.....Center
R. F. Shannon..Edgeworth Sta.....Allegheny

FAVEROLLES.

Pa. State College..State College.....Center

WYANDOTTES.

Jas. I. Thompson (W).Lemont.....Center
T. E. Orr (All Varieties)..Beaver.....Beaver
Pa. State College..State College.....Center
Bayard Bros. (Wh)...Waynesburg....Greene
Wm. F. Gable (Bf)..Altoona .....Blair
Julius LeMoyne (Wh)..Washington....Wash
F. E. Traver (Buff)..Wyebrooke.....Chester
R. W. Crothers & Son (W) Taylorstown,Wash
N. Poorbaugh (W)..Mt. Pleasant...Westm'd
Pa. State College..State College.....Center
R. F. Shannon..Edgeworth Sta.....Allegheny
B. L. Post's Sons..Claysville.....Washington
A. G. Shaffer (Sil.)..Rural Valley.Armstrong

BUFF ORPINGTONS.

T. E. Orr.....Beaver.....Beaver
W. A. McCoy & Sons..Mercer.....Mercer
R. F. Shannon..Edgeworth Sta....Allegheny

TURKEYS.

Edward Walter.West Chester.....Chester
H. C. & M. R. Elder (Br).Darlington..Beaver
T. M. Shively (WHol).Mifflinburg.....Union
B. L. Post's Sons (MB) Claysville.....Wash.
J. M. Berry (WHol) Wylandville.....Wash.
W. A. McCoy & Sons (W Hol) Mercer..Mercer
A. G. Shaffer..Rural Valley.....Armstrong
J. R. Truxal....Greensburg.....Westm'd
R.W. Crothers&Son (WH) Taylorstown,Wash.
D. N. App (WHol)..Selinsgrove.....Snyder
J. L. Stouffer (MB)....Southwest..Westm'd
W. H. Gray (MB) Brookville.....Jefferson

WHITE-TIPPED BLACK SPANISH.

Pa. State College..State College.....Center

DUCKS.

W. A. McCoy & Sons (Pekin)..Mercer.Mercer
J. F. Lantz & Co. (Pekin)..Glenmoore.Chester
W. H. Gray (Pekin)..Brookville....Jefferson

GUINEAS.

W. A. McCoy & Sons (W)..Mercer....Mercer

GEESE.

T. M. Shively (WChi)..Mifflinburg.....Union
W. A. McCoy & Sons (WChi)..Mercer.Mercer

PEAFOWLS.

W. A. McCoy & Sons..Mercer.....Mercer

PIGEONS.

W. A. McCoy & Sons (WFan).Mercer..Mercer

PETS.

BELGIAN HARES.

Name.	Postoffice.	County.
H. C. Bughman	Greensburg	Westm'd
Eagley Bros.	North Springfield	Erie
W. J. Monroe	Greensburg	Westm'd

DOGS.

Name.	Postoffice.	County.
J. F. Lantz&Co. (Beagles)	Glenmoore	Chester
T. Turnbull Jr. (Bull Terriers)	Allegheny	Al.

COLLIES.

J. Grier Dain.....Malvern.....Chester
T. E. Orr.....Beaver.....Beaver
B. L. Post's Sons..Claysville.....Washington
Edward Walter ..West Chester.....Chester
B. W. McKeehan..Mt. Rock.....Cumberland
H. M. Lyon & Sons..Wyalusing.....Bradford
T. M. McKee.....Lewistown.....Mifflin
W. H. Gray.....Brookville.....Jefferson

AIRESDALE TERRIERS.

R. F. Shannon..Edgeworth Sta....Allegheny

ENGLISH SHEEP DOGS.

B. W. McKeehan..Mt. Rock.....Cumberland

SCOTCH TERRIERS.

R. F. Shannon..Edgeworth Sta....Allegheny

BLOODHOUNDS.

Jas. Lindsey & Sons..Utica.....Venango

MELROSE FARM

GUERNSEYS

IN THE HERD ARE

PONG No. 8398

Sire Imp. Island Champion No. 6263, Dam Marguerite of Level Green No. 7966.

MY LADY BALTIMORE No. 7829

Sire Lord Baltimore No. 456, Dam Imp. Emeraude No. 1994.

GOLD ELSIE OF HADDON No. 11263.

Sire Violet's Duke No. 4222, Dam Glenwood Girl 7th No. 9114, and Advanced Register No. 9.

BESSIE OF HADDON No. 14052

Sire Donald of Pinehurst No. 5643, g-sire Mainstay No. 3789, Dam Lucretia of Haddon No. 10831, and Advanced Register No. 4.

GRACE DEAN No. 12383

Sire Millwood's Cousin Alfred No. 4879, Dam Mildred Jocelyn No. 6562.

MAGGIE DICKSON No. 11036

Sire Erwin of Cannonsburg, No. 4543, Dam Emma Hart No. 8710.

SIS HOPKINS OF LINDON HOME No. 16775

Sire Lily Ella's Jeweller No. 5417, Dam Lady Margaret 2d No. 10313.

BELLE OF ROSENDALE No. 6949

Sire Aeneas No. 5853, Dam Belle Brandon 3d No. 16745.

And others of the same breeding,
or of equal merit.

H. C. BUGHMAN,

OWNER,

IRA E. BROWN, Supt. GREENSBURG, PA.

J. F. LANTZ. J. IRVIN LANTZ.

J. F. LANTZ & CO.

Shropshire Sheep,
Jersey Cattle,
Chester White Hogs,
Barred Plymouth Rocks.

We are the originators, breeders and owners of "The Famous Flock of Waterside Shropshires" which was founded in 1888. Our stock is all recorded, and Waterside Shropshires can be traced through the records to the oldest and purest flocks in the world, and they are direct decendants of the most noted English prize winners.

Waterside flock is the oldest line bred flock of Wool-Mutton Shropshire sheep in Pennsylvania, and is one of the best wooled flocks in the world, as verified in the world's last and greatest contest, which the following letter will show.

BY AUTHORITY OF THE LOUISIANA PURCHASE EXPOSITION.

St. Louis, U. S. A., January 24th, 1905.
Messrs. J. F. Lantz & Co., Glenmoore, Pa.
Dear Sirs:—

It affords us much pleasure to notify you that the official Award List as handed us by the Superior Jury shows that you were given the High Distinction of Gold Medal in Group 95, Department of Agriculture, for wool. This is the highest award for Shropshire wool and you are accordingly warranted in making that fact public.

Respectfully,
The St. Louis Official Award Ribbon Committee.

The highest class best wooled imported rams that money can buy are always used for the further improvement of Waterside Flock.

When you want high class Shropshires, write to

J. F. LANTZ & CO., **Glenmoore, Pa.**

Jersey Home Stock Farm.

BREEDERS OF

A. J. C. C. Jerseys

Brown Leghorn and White Plymouth Rock Chickens.

M. P. SHOEMAKER & BRO.,

Bell Phone 360, Ring 2. GREENSBURG, PA.

CHIPPEWA FARM

REGISTERED JERSEYS.

St. Lambert, Tormentor, Golden Lad and Eminent 2nd blood all represented in our herd.

Let us quote you delivered price on

CHIPPEWA AGRICULTURAL LUMP LIME.

——WRITE NOW.——

M. E. REEDER,

R. F. D. No. 2. MUNCY, PENNA.

Gombault's Caustic Balsam

The Worlds Greatest and Surest

Veterinary Remedy

HAS IMITATORS BUT NO COMPETITORS!

SAFE, SPEEDY AND POSITIVE.

Supersedes All Cautery or Firing. Invaluable as a CURE for:

FOUNDER,
WIND PUFFS,
THRUSH,
DIPHTHERIA,
SKIN DISEASES,
RINGBONE,
PINK EYE,
SWEENY,
BONY TUMORS,
LAMENESS FROM SPAVIN,
QUARTER CRACKS,
SCRATCHES,
POLL EVIL,
PARASITES.

REMOVES

BUNCHES or BLEMISHES,
SPLINTS,
CAPPED HOCK,
STRAINED TENDONS.

SAFE FOR ANYONE TO USE.

We guarantee that one tablespoonful of Caustic Balsam will produce more actual results than a whole bottle of any liniment or spavin mixture ever made Every bottle sold is warranted to give satisfaction Write for testimonials showing what the most prominent horsemen say of it. Price, $1.50 per bottle. Sold by druggists, or sent by express, charges paid, with full directions for its use.

The Accepted Standard VETERINANY REMEDY

Always Reliable. Sure in Results.

None genuine without the signature of
The Lawrence-Williams Co.
Sole Importers & Proprietors for the U.S. & CANADAS. CLEVELAND, O.

THE BEST FOR BLISTERING.

I have used GOMBAULT'S CAUSTIC BALSAM quite a good deal, and for a blister it's the best I ever used. I wish your remedy every success.
CHAS. MOTT, Manager.,
Mayfield Stud Farm, Leesburg, Va.

CURED CURB WITH TWO APPLICATIONS.

Have used your GOMBAULT'S CAUSTIC BALSAM to cure curb. I blistered it twice, and there is no sign of it any more. The horse is as good as ever.—DAN SCHWER, Evergreen, Ill.

Sole Agents for the United States and Canada.

The Lawrence-Williams Co.

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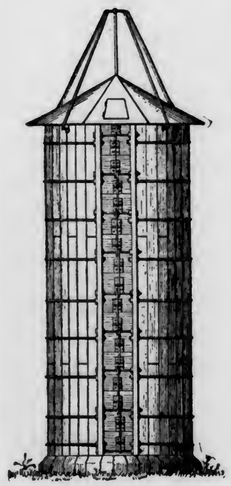

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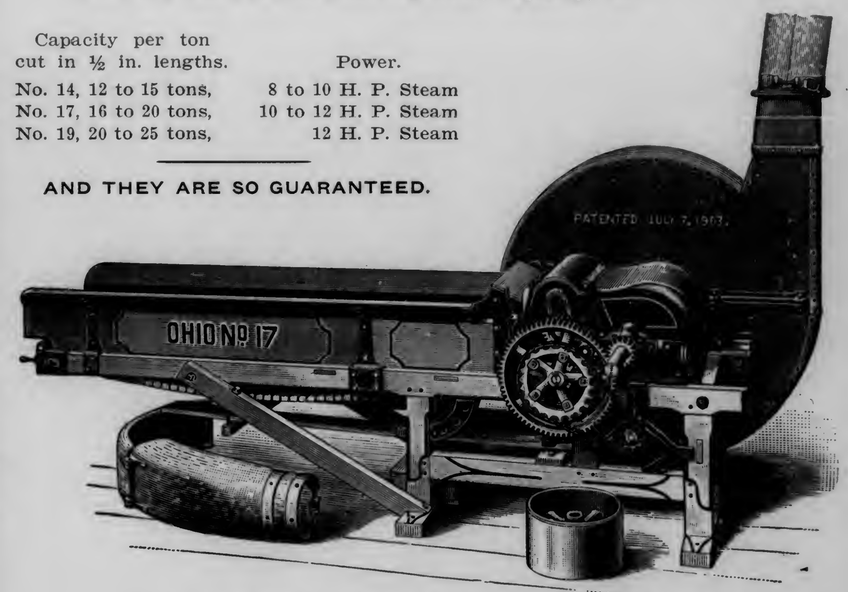

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